

THREE SECONDS FROM DEATH!

# POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REGD. TRADE MARK, U.S. PAT. NO. 40438

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NOV.  
25 CENTS



SEE PAGE  
698

DON'T PITY THE POOR ESKIMO



# "I POURED A DEATH POTION FOR MY SICK BABY!"

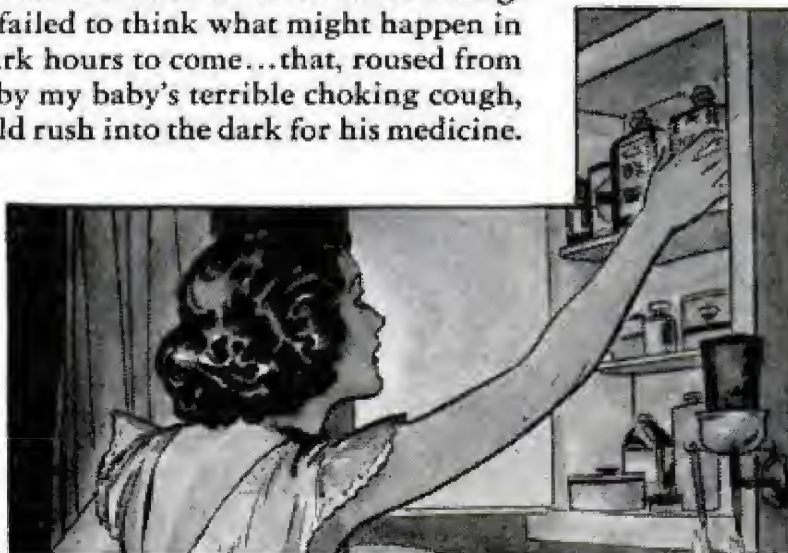


## LONG ISLAND MOTHER LIVES A NIGHTMARE IN DARKENED HOME

① "Our year old son was seriously ill with whooping cough, my husband was down with the grippe... and to add to my problems I blew the electric fuses as I was going to bed," writes Mrs. Camille Dearkin of 222-09 135th Avenue, Springfield Gardens, L. I.



② "I didn't know how to fix the lights and decided not to disturb my husband. He could tell me what to do in the morning. But I failed to think what might happen in the dark hours to come...that, roused from sleep by my baby's terrible choking cough, I would rush into the dark for his medicine.



③ "I fumbled in the dark medicine chest for the cough syrup and a teaspoon, that ghastly cough frightened me so. It seemed he must be choking to death! My hand shook so in the dark I kept spilling the medicine and I realized I must have light to measure a proper dose...so, in spite of my panic, I took time to get my husband's flashlight.

④ "In the rays of that light, I saw in my hand, not my child's cough mixture, but a bottle of deadly poisonous disinfectant!

"Is it any wonder that I now write to let you know that my husband and I have fresh DATED 'Eveready' batteries to thank for our baby's life.

(Signed)

*Camille Dearkin*



**FRESH BATTERIES LAST LONGER... Look for the DATE-LINE**



NATIONAL CARBON COMPANY, INC., 30 EAST 42nd STREET, NEW YORK, N. Y.  
Unit of Union Carbide **UCC** and Carbon Corporation



# ANNOUNCING THE BIG NEW 1939 PLYMOUTH

*"So Beautiful You Won't Believe  
It's a Low-Priced Car!"*

GLAMOROUS NEW DISTINCTION IN STYLING... Longer Wheel-base... New High-Torque Engine Performance... Perfected Remote Control Shifting... New Auto-Mesh Transmission... New Amola Steel Coil Springs... New "Safety Signal" Speedometer.

## NOW ON DISPLAY NEW "ROADKING" NEW "DE LUXE"

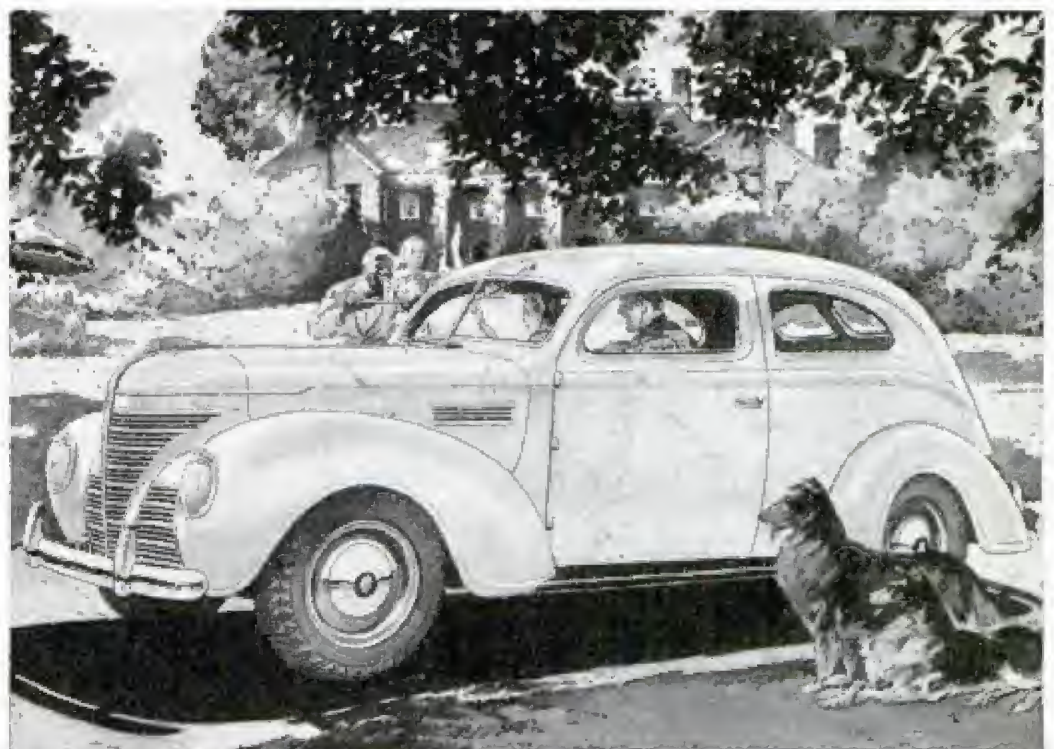
**N**OW READY for you to see, the most exciting automobiles the low-price field has ever known... the brilliant new 1939 Plymouths!

Biggest surprise is Plymouth's magnificent new styling... amazing extra room... luxurious new upholstery.

And with Plymouth's new Amola Steel Coil Springs and improved Airplane-type Shock Absorbers, you get an amazingly smooth, soft ride on even the roughest roads.

Plymouth's new High-Torque engine performance will thrill you. Yet the 1939 Plymouth is more economical than ever before.

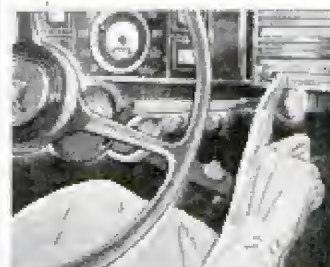
See this great car today. It's the biggest "value package" ever offered in the lowest-price field!



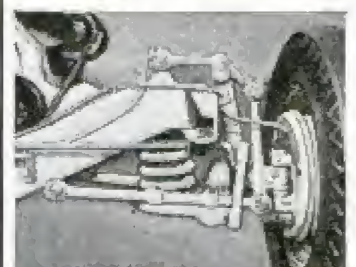
THE GLAMOROUS NEW 1939 PLYMOUTH! Experience the new smoothness of its improved Floating Power engine mountings, its easier-acting hydraulic brakes. See it today... on display at your nearby Plymouth dealer!



SO BEAUTIFUL you won't believe it's a low-priced car. Completely rust-proofed all-steel body.



REMOTE Control Gear Shifting with Auto-Mesh Transmission, standard on De Luxe models.



THE FINEST front springing design... Amola Steel Coil Springs... gives a wonderful new ride.

## PLYMOUTH BUILDS GREAT CARS

### PRICED WITH THE LOWEST—EASY TO BUY

Your present car will probably represent a large proportion of Plymouth's low delivered price... with the balance in surprisingly low monthly installments. Make a point of driving this great new Plymouth before you buy any car today. See your nearby Plymouth dealer. PLYMOUTH DIVISION OF CHRYSLER CORPORATION, Detroit, Michigan.

TUNE IN MAJOR BOWEN AMATEUR HOUR, C.B.S. NETWORK, THURS., 9-10 P.M., E.S.T.

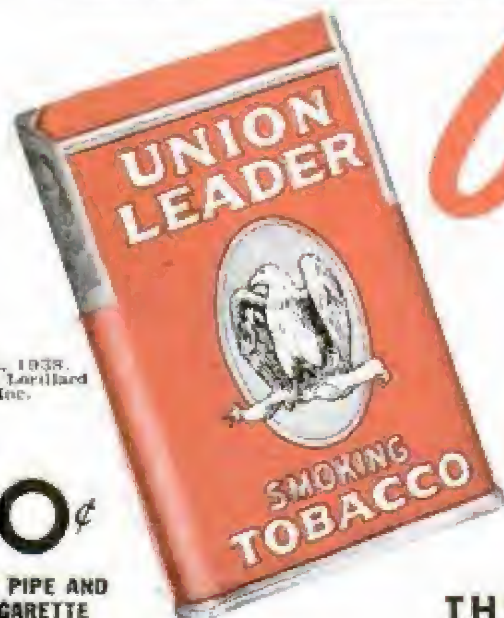


# A perfect blend- A perfect friend

**IN 1913** . . . "About the time of this picture I was doin' my darnedest to like pipe smoking but it wasn't until I came across Union Leader, that I found how sweet and mellow a pipe tobacco could be. And Union Leader and me are even better pals today than 25 years ago."



**TODAY** . . . "I'm 65 now and looking back at a long life, I can truthfully say Union Leader has done a lot to make the hard times easier and the good times better. I never expect to find kindlier tobacco I like so well at any price, bar none. The cool, even way that Union Leader burns makes it mild as well as rich in flavor."—Mr. E. G. Ross, Newport, Minn.



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by P. Lorillard  
Co., Inc.

**10¢**

**FOR PIPE AND  
CIGARETTE**

## Union Leader

**ALWAYS** . . . Day in and day out, for more than a third of a century, UNION LEADER has brought thousands of men deep smoking contentment. This choice hill-grown Burley from Kentucky is aged in oak and specially processed to remove all burn and bite. You'll find it the mellowest, most flavorful tobacco a dime ever bought! Try a tin . . . *today!*

**THE GREAT AMERICAN SMOKE**



# Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

November, 1938

Vol. 70, No. 5

## Special Features

New Oil Wells from Old Ones	641
How Fast on Wheels?	645
Ether Jumpers Never Sleep	Coloroto
Don't Pity the Poor Eskimo	658
Ocean-Going Weather Stations	669
Three Seconds from Death	674
Life Guards with Wings	680
Lightning Dodgers of the Forest	690
Keeping Zoo Animals Happy	700
The Secrets of Speed	706
Click Around the Clock	722
Chemistry and Your Car	732

(Continued on next page)

## Aviation's "Growing Pains"

**L**ITTLE by little, aviation engineers are revolutionizing the art of flying. Today's big transports are vastly improved over those of only a year or two ago although an untrained eye can hardly spot the differences. Scores of slight improvements in power plants, instruments and construction have vastly increased speed, efficiency and safety. Behind the scenes the engineers are working on still other improvements—things like height indicators to tell pilots the exact distance down to the ground, opposite-turning propellers, ways of putting exhaust gases and radiator cooling air to work, and static eliminators. An article in the December issue reviews the progress of aviation during the past year or two and lists some of the improvements which may be expected in the near future. It's titled "Behind the Scenes in Aviation" and is illustrated with eight pages of Coloroto pictures.

## Next Month

**M**ARK TWAIN complained that everyone talked about the weather but no one did anything about it. Irving Krick, a young meteorologist, has done something. With the aid of an air mass analysis forecasting system, he tells movie directors when to go on outdoor location, warns anti-freeze manufacturers of impending cold snaps and advises soft-drink makers when the mercury will go up and boost their sales. An article next month explains how he does it.

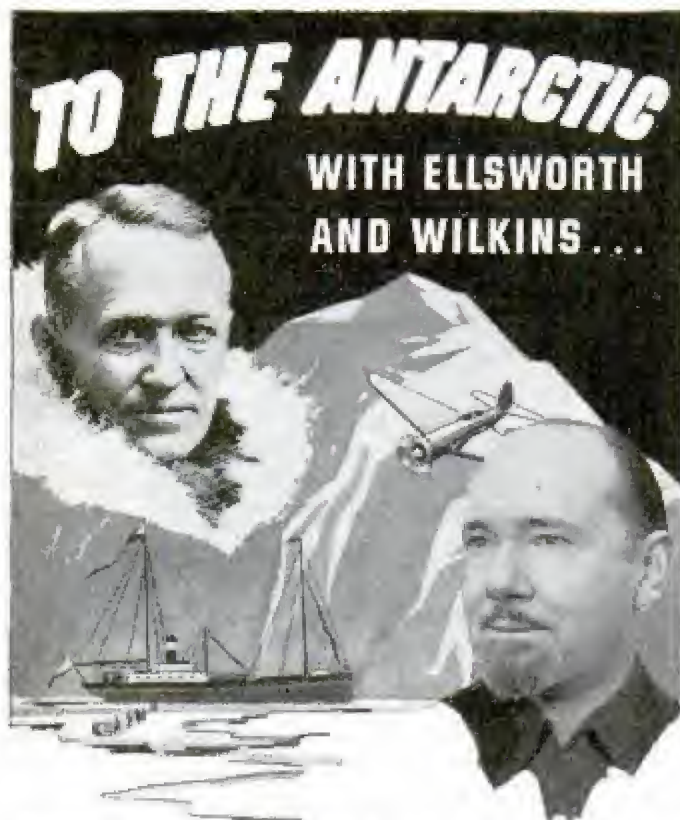
## Lifesaving Firemen

**P**UTTING out fires is only a secondary job of modern fire departments. Saving lives comes first and most fire departments today have trained rescue squads which respond to every alarm. These men are the real fire eaters, ever ready to risk their lives to save the lives of others. An article next month tells how the rescue squads operate.

## Death Rays for Bugs

**I**NSECT pests cost American farmers about \$2,000,000,000 a year. They now are being attacked with traps which project light rays to lure the bugs to their doom. Thus electricity is playing a new role in agriculture and an article in the December issue describes the amazing results obtained where light rays have been used to war on insect pests.





## PYROIL GOES ALONG TO SAFEGUARD ENGINES OF THE M/S "WYATTEARP" AND OTHER MOTORIZED EQUIPMENT

Once again Pyroil has been slugged out for a service of protection where safety is a requisite to success. For, Pyroil goes along on Commander Lincoln Ellsworth's present Antarctic Expedition with Sir Hubert Wilkins—to Capetown, to Enderby Land, to Little America!

What a signal honor to accompany these renowned explorers, famed for their earlier and thrilling conquests of both Polar regions of the world! But Pyroil—tested by their engineers in voyaging from Norway to New York—will repay the confidence they have placed in it.

Pyroil will repay you, too—many times over—when you use it in your automobile. It will enable the engine of your car to operate safely and efficiently under normal conditions as well as those of emergency and strain. It will offset many common repairs.

Ask your service station attendant today to tell you exactly how and why Pyroil is most important to safe and good engine operation. Or, simply Mail Coupon below. Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 511 Pyroil Bldg., LaCrosse, Wisconsin, U. S. A.



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## (Contents—Continued)

### AUTOMOTIVE

Amphibian "hippo" car travels on road or river.....	667
Knee-high motorcycle on airplane tail wheels.....	672
Oil jet replaces auto gears for smoother running.....	672
Twelve-wheel-drive truck.....	679
Rigid sun awning for auto.....	695
Tractor moves a forest of palm trees.....	695
Pilot designs a streamline "push-button" car.....	705
Midget three-wheeled auto.....	720
Ancient steam roller revived by gas engine.....	721
Thrill driver in flame-drenched car.....	729
Twelve-cylinder race car has streamline form.....	729
Motorcycle with frame of pressed steel.....	730
Traffic movie made from car teaches safety.....	730
Nautical ventilator for cab of truck.....	731

### AVIATION

Autogiros line up in "sky ladder" formation.....	665
Steel blades of sky liners on "dress parade".....	678
Nose mask for stratosphere leaves mouth free.....	688
Ice on plane shown in wind tunnel.....	694
Flying greenhouse for army air observers.....	697
Berlin-New York round trip.....	704
Aural radio range demonstrator.....	713
Balloons bring rescue plane to jungle party.....	721
Two plane motors drive a single propeller.....	731

### BOATS

New "Mauretania" replaces former sea queen.....	663
Ship weather stations solve secrets.....	669
Mine-laying submarine latest in war craft.....	698
Science puts speed into big racing yachts.....	718
Homemade houseboat tours the Mississippi.....	727
Fishing boat has luxuries of ocean liner.....	728

### CONSTRUCTION

Thirteen-mile water tunnel "holes through".....	664
Waste ashes used for building home.....	664
Store awning of aluminum saves replacing.....	686
Ladder bracket for painters.....	687
Classroom of glass outmodes little red schoolhouse.....	689
Road grader has bridge for trucks.....	712
"Mother Goose" bungalow shelters ducks.....	736

### FARMS

Japanese beetles trapped by the quart.....	668
Grasshopper trap on front of car.....	696
Volcanic eruption blamed for poison element in soil.....	705
Egg grader.....	717
Wheat-field vacuum rids farms of crickets.....	720

### MODELS

Miniature amphibian plane.....	667
Paintings on old bottles prove profitable hobby.....	672
Disabled stonemason builds miniature rock houses.....	679
Starter for model airplane engines.....	686
Four-motored model of clipper ship.....	713

### PHOTOGRAPHY

Aerial camera carries 500-foot film.....	663
"Photographic eye" spans but eight words.....	686
Stereoscopic pictures make aerial relief map.....	694
"Slide-room" exposure meter for pictures.....	699

### RADIO AND ELECTRICITY

Miles of neon light ten-story signs.....	657
Telephone wires are plowed under.....	664
Radio waves heat a rivet.....	665
"Read-while-you-eat" lamp.....	665
High-voltage power line across nation seen.....	671
Electric meter on street post saves money.....	696
Army's sound unit heard a mile away.....	711
Lighting fixtures molded of plastics.....	712
Dual-diversity receiver has single control.....	737
How to build an all-purpose power supply.....	738
Inexpensive volt-ohmmeter operated on a.c.....	740
Practical radio suggestions.....	741
Radio cabinets in period designs.....	742
Television parts available for experimenters.....	742
Two beam-power tubes in one.....	742

### SCIENCE AND INDUSTRY

Milk really goes places.....	678
Mining banned near Mt. Palomar.....	684
Super-pyrometer tests heat.....	688
Aluminum reflector forecasts heat.....	696
You can't hear the northern lights.....	728

(Continued to page 6A)



# To motorists meeting

## TRIPPE SAFETY LIGHTS

### on the road



**YOU CAN TELL** them coming at you by the tremendous flat beam of light giving daylight to the road substantially beyond headlights — **BUT WITHOUT A BIT OF GLARE IN YOUR EYES.** The entire light beam is below your eye level.

When a Trippe equipped car approaches you from the rear, you will think first that your headlights have stepped up three or four times in strength. The fact is the Trippe beam is shooting under your car and lighting the road ahead of you. What will amaze you is that you get no reflection in your rear-view mirror. You will long to ride forever in that beautiful flood of white light that banishes blind spots and gives you a feeling of driving comfort and security you have never known before.

In rain or fog, these cars will pass you comfortably and with safety, because objects that you cannot see at

all are picked up clearly by the Trippe dual beams. Roads that are black to you are whiter to the driver behind the Trippe Lights.

Subconsciously, everybody has realized that a new kind of light had to be the only practical answer to cutting the night-time death and injury toll. There is no better demonstration of the public's sincerity "to do something about it" than the fact that the first 150,000 motorists and bus and truck owners to learn about the Trippe Light here and abroad bought Trippe Lights for their own cars.

The principle of the Trippe Safety Light is dual light beams from a double reflector system passed through optically correct ground and



The Trippe beam goes under the fog, and lights objects ahead. With no glare bouncing back at you, you see the lighted objects through the fog.



Night accidents are generally caused by "over-driving your headlights." Trippe Safety Lights give you visibility beyond the headlights. They lessen glare and minimize the "blind spots" after bright headlights have passed.



With night-time accidents up 37% while day-time accidents have dropped 12%, motorists everywhere instantly recognize the Trippe Light as the most vital safety development of our time.

polished white glass lens. The flat power beam cuts off sharply about 26 inches above the ground.

Perhaps the clearest way to convey a picture of the Trippe Light is by the following list:

It lights the road substantially beyond your headlights.

It lights the entire road—from ditch to ditch. It reduces glare to less than dimmers.

It makes black roads whiter.

It lets you SEE through fog, rain, mist and snow.

It lessens eye-strain and fatigue.

It minimizes blind spots in passing.

It throws a "flat" beam that hugs the ground.

It eliminates glare in the rear-view mirror for the driver ahead.

★ ★ ★

It is legal everywhere.

It uses no more current than an ordinary headlight.

It is chromium plated over solid brass—no rust or tarnish.

It is easily installed — brackets, cable, switches and socket wrench with each light.

It is theft proof.

The value of the Trippe Light is naturally measured in the saving of life and limb. But the comfort and lack of mental and physical strain which you feel every minute you are driving at night will make the Trippe Light a necessity to you once you have seen it in action.



**\$17.50**

(Installation extra)

\$35.00 per pair

(installed)

Prices slightly higher in Canada

# TRIPPE

## Safety Light

Factories in United States, Canada and England. Representatives in 25 countries.

No matter how much you read about the Trippe Light, you can never quite picture the actual sensation of driving behind this new kind of light.

Today, we are glad to say, most car dealers and important service stations are in a position to give you a demonstration of the Trippe Light. Any car, bus or truck of American or foreign make can be equipped. When you trade in your car, your Trippe Lights can be quickly transferred to the new car.

As the Trippe factories have not been able to keep very far ahead of orders, we urge you to place your order with your dealer promptly to secure immediate delivery.

We will be glad to send, on request, complete details of the Trippe Light without cost or obligation. Address your inquiry to Department PM-1.

TRIPPE SALES COMPANY, Chicago, U.S.A.



You recognize the Trippe Light by the round metal medallion right in the center of the lens. The lamp is 8 1/4" in diameter. Mounted approximately 26" from the ground, the Trippe Safety Light throws a powerful beam which normally stays at the same level.



The Trippe flat beam lights the road for the driver—showing obstructions not visible with ordinary headlights and yet produces no glare in the eyes of the approaching driver or pedestrian.



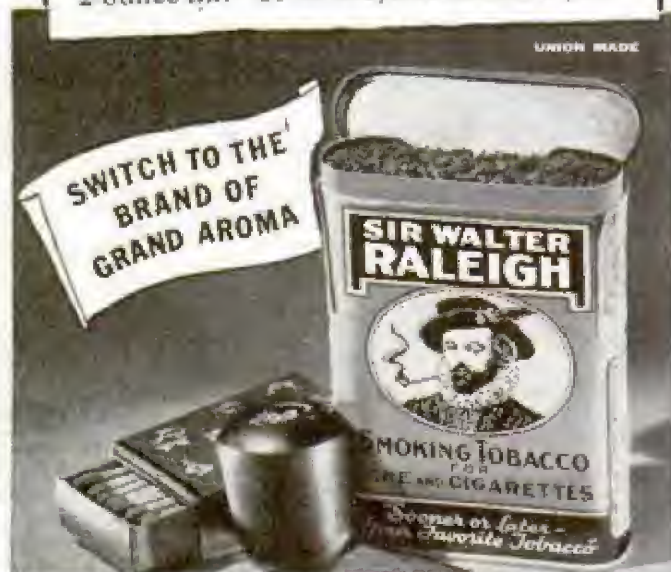
## "SHURE AND HIS PIPE DISTURBED TH' PEACE!"



"MARRY ME, MARY?" But before she could answer, Frank's gooey-smelling pipe floored her. She just couldn't stand that strong, rancid tobacco. But Murphy saved the day!



"FAITH AND BEDAD! Clean that pipe and fill up with my Sir Walter—the most fragrant blend of extra-mild burleys ever put in a 2-ounce tin!" So he did, and she said "yes."



**FREE BOOKLET** tells how to make your old pipe taste better, sweeter; how to break in a new pipe. Write for your copy today. Brown & Williamson Tobacco Corporation, Louisville, Kentucky, Dept. P-811.

**TUNE IN** Tommy Dorsey and his orchestra. Every Wednesday night, coast-to-coast, NBC Red Network.

## (Contents—Continued)

### SPORTS

Trotting horse dresses like football player .....	673
Lighted fish lure of colored plastic .....	684
Queer ways of fishing with lance and gun .....	685
"No limit" to fishing with barbless hook .....	697
Pedal boat race .....	710
Rumble seat on handle bar carries baby .....	716

### TOOLS

Air flow gauges dimensions of precision parts .....	666
Electric stylus etches marks on metal .....	678
Lathe grinder for small shop .....	710
Combination tool of neolithic man .....	720

### WORKSHOP

Woodworking shop on wheels visits school grounds .....	687
Complete home workshop built in kitchenette .....	726
Torch and lathe spin hard metal .....	727

### MISCELLANEOUS

Four-wheel trucks give smoother ride .....	666
Additional sources of rubber guard against shortage .....	668
Baby rides on dad's back while he is fishing .....	668
Merchandise labels run through typewriter .....	684
Wheeled produce basket displays goods at door .....	684
Record disk teaches foreign language .....	686
"Old 168" quits rails to be a monument .....	689
Self-service vendor tallies cost of purchase .....	694
Utensils hung inside steel kitchen cabinet .....	694
Cairn marks halfway between equator and pole .....	699
Barrels filled without upending them .....	704
Vast canyons found by "echo" recorder .....	704
"Why bother" offers first aid .....	710
Endless chain hauls transfer trucks .....	712
Facts and figures stranger than fiction .....	714
Fluoride water guards teeth, study indicates .....	716
Lightweight electric ironer .....	716
"City of tomorrow" seen from hanging walk .....	717
"Ammonia suit" for rescue squads .....	736
"Two-passenger" harmonica .....	736

## (Craftsman and Shop Notes)

### AUTOMOTIVE

Auto shortcuts .....	797
Car-door bumpers are reversed to stop rattling .....	798
Hints to remember when checking car .....	798
Reverse gas filter gasket after cleaning .....	798
Brake on auto mechanic's car prevents shifting .....	799
Car fires quickly extinguished with soda water .....	799
Strong arbor press from hydraulic auto jack .....	799
Check differential carrier before riveting new gear .....	800
Drying wet ignition system .....	800
Sealing car against dust leaks .....	800
Seat for baby straddles mother's lap .....	800
Simple tool cleans piston-ring grooves .....	800

### ELECTRICAL

Cleat spaces electric wires and supports lamp .....	764
Thermostat controls temperature of electric oven .....	779
Rewiring building with aid of compressed air .....	796
Splicing low-voltage electric wires .....	798

### FARMS

Rhubarb grown in basement during winter months .....	750
Trailer tank hauls tractor fuel to field .....	778
Guard keeps cattle from opening gate latch .....	782
Harness traces held on singletree by spring .....	784
"No Hunting" sign from farm disks .....	784
Scraper cleans lugs on tractor wheels .....	786

### FURNITURE

Brass fireplace screen has pine-tree motif .....	748
Latest wall tables .....	758
Slats replace cane seats on porch chairs .....	775

### HAND TOOLS

Sliding tool rest for grinder .....	746
Triangle altered to draw beams and threads .....	750
Baffling blowtorch to burn off paint .....	752
New magnets are useful .....	753
Attaching chuck wrench to drill press .....	756
Gauge aids in truing saw teeth .....	757
Gauge to select drills for taps .....	770
Curved ruler to measure distances on globe .....	770
Machinists' sliding-hammer tool has attachments .....	783
Gauge to check diameter of holes .....	784
Clamping beveled work .....	785

(Continued to page 8A)





# Plan Your Future

## Choose Your Field NOW For Success

Will you master fate or will fate master you? That's a question deserving your honest answer...right now! Actually it is largely up to you. You can do with Life almost what you will. LaSalle will help you establish yourself for real success by providing you with the comprehensive, specialized training for which it is so famous. Choose your field...now! Check the coupon below for the free booklet you want us to send you. It can be your first step toward assured success.

### Opportunities in Traffic Management

The field of Traffic Management offers real opportunity only to the man who knows. Spare time study and the will to succeed have pushed scores of Traffic employees up the ladder to financial success. Many LaSalle-trained traffic managers—both in the railroad and industrial field—now command salaries of \$3,000.00 to \$5,000.00 a year—and better. Investigate. Find out how you can qualify for these higher positions through LaSalle home-study and guidance.

### Law for Business Success

And it isn't necessary to practice law to get this Success. In fact probably most of the men who study law today have no idea of taking the bar examination or becoming lawyers—they want law training to give them mastery of men and situations in business. You know that—

- (1) the man with legal training is a leader—not a follower.
- (2) legal training keens your mind—clears away the problems that stump the ordinary fellow and makes you master instead of man.
- (3) knowledge of law simplifies the complications of executive work.
- (4) Many top executive places are filled by men who have studied law.

No matter whether you are in a big corporation or a small business—in a great city or a little town—a practical knowledge of law cannot fail to be of real and vital help to you in making a more successful career.

In every state in the union you'll find law-trained men who came up through LaSalle. What others have done, you can do.

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Executives who are efficient managers command responsible positions and good incomes. And the need for

trained executives is growing rapidly. We train you thoroughly at home in your spare time for every type of executive work—teach you the principles and practices used by our most successful business leaders and help you develop your management capacity—by a training built with the aid of outstanding executives.

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The demand for skilled accountants—men who really know their business—is increasing rapidly. New state and federal legislation requires much more, and more efficient accounting from business—big and small. Corporations are in constant need of expert counsel in matters relating to Auditing, Cost Accounting, Business Law, Organization, Management, Finance. Men who prove their qualifications in this important branch of business are rapidly promoted to responsible executive positions—given an opportunity to earn real salaries. The range is from \$2,000.00 to \$10,000.00 a year—even to higher income figures.

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Your training will be under the direct supervision of a staff of legal, organization and management specialists, business efficiency engineers and Certified Public Accountants.

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This One



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...MY BATTERY'S GONE DEAD!

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● IT'S A FACT! No matter how long you own your car—no matter how far you drive it—if the Goodrich Kathanode Electro-Pak\* you buy fails to give satisfactory service in that car, The B. F. Goodrich Company will replace it, *without charge*, as clearly stated in the written guarantee.

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battery is worth  
money**

To make it easier for you to enjoy quicker starts with this new Goodrich Kathanode Electro-Pak *right now*, your Goodrich dealer will give you a liberal trade-in allowance on your old battery.



\*Made under the Kathanode patent.

Get off to a *Flying Start* with a

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KATHANODE  
*Electro-Pak* BATTERY

## (Contents—Continued)

Tools marked with numbered nails .....	786
Caliper attachment to hold welder's crayon .....	788
Notched leg improves calipers .....	788
Spring to eject small parts from vise .....	796

### HOUSEHOLD

Homemade steamer to remove wallpaper .....	745
Flower urns from auto headlamps .....	750
Hook to hang pictures on wall board .....	750
Old paintbrushes converted to dusters .....	757
Salt and pepper shakers of wood and metal .....	757
Glass bottle stopper removed with glycerine .....	764
Pictures interchanged quickly in frame .....	767
Holder for washing-machine mangle .....	768
Cleat on ironing board stores cord .....	769
Draft inside chimney increased by cone collar .....	770
Removing grease spots .....	774
Sink table to prepare vegetables .....	774
Wood cover for guest book .....	774
Trip on alarm clock opens furnace draft .....	775
Solving home problems .....	776

### MODELS

Bells and bitts for model boat .....	764
Fence bars spaced by balls for soldering .....	767
Tool to shape ship-model moldings .....	770

### POWER TOOLS

Sanding disks attached with rosin .....	747
Tool rest for large faceplate work .....	768
Tapping fixture for small parts .....	786
Lathe arbor support eases work .....	788
Table on drill press to rotate work .....	788
Precision machine tools turned on lathe .....	789
Turning duplicate radii with swivel tool post .....	794
Lathe sanding table fits toolpost holder .....	795
Heavy arbor centered single-handed .....	796

### STORE AND SHOP

Anchoring springs to webbing on furniture .....	752
Fork to catch fowls in crate .....	784
Sealing large number of envelopes by hand .....	795

### TOYS AND NOVELTIES

Barrel-body chariot thrills back-yard warrior .....	744
Scooter folds over for small storage space .....	746
Gadget to help solve crossword puzzles .....	763

### WOODWORKING

Turned novelties in figured gumwood .....	743
Dowel cutting gauge saves time .....	756
Sanding sticks for scroll work .....	756
Crafting with foil molding .....	765
Lasting beauty in a wood finish .....	771

### MISCELLANEOUS

Contour sanding block smooths irregular edges .....	745
Fertilizer for potted plants .....	746
Sand trap prevents wear on pump valves .....	746
Knob to turn world globe protects surface .....	747
Shellac your golf clubs .....	747
Trouser cuffs held by snap fasteners .....	747
Penetrating oil works rapidly with soldering iron .....	750
Auto springs give tennis nets even tension .....	752
Multi-color paint pail made from cans .....	752
Climbing high poles with rope loops .....	756
Lock hasp from strap hinge .....	757
Antique candle sconce tapped from brass .....	763
Photos made with ground glass and spotlight .....	764
Pipe keeps ladder from twisting .....	768
Washers provide good cord ties .....	768
Sparring partner gives you daily exercise .....	769
Locating particle in eye with magnifying glass .....	770
Repairing typewriter carriage bar .....	778
Cleats on platform save labor for truckmen .....	782
Hinged door on drain pipe .....	782
Signal lantern bases from brake drums .....	782
Nails and washers make speedy slotters .....	783
Pipe routs inlay designs and cuts dowels .....	785
Small cement mixer has geared hand crank .....	787
Wood protected against rot .....	795
Installing modern centrifugal pump .....	796

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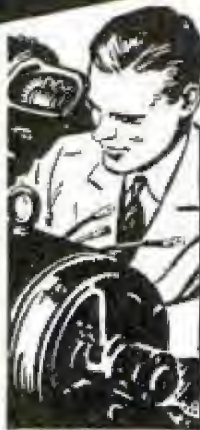
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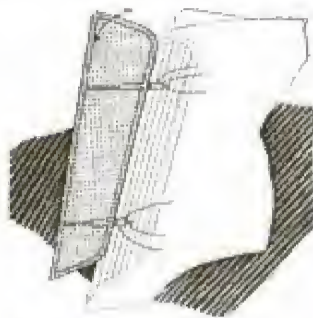
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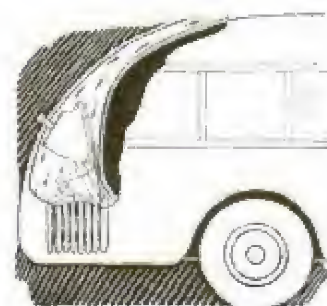


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**H**OLDING the possibility of adaptation to automobiles, a means of keeping rear engines cool in motor coaches has been patented. In addition to the cooling by water circulating through the radiator, which is arranged above the engine in a hori-



zontal plane, an air intake extending to the roof of the coach is provided. Through this duct air is introduced into the engine compartment, being directed in a draft downward from the opening on the roof.

**C**ONVERTING the coupe or coach into a vehicle with rumble seat would be possible with an invention patented recently. It provides for shaping the car's body so that a portion projects at the rear, like a built-in trunk. A cover on this compartment is pulled back and swung slightly downward, sliding the seat out of the passenger compartment and into position for use as a rumble seat. The arrangement gives more room in the car's interior and also allows the rumble seat occupants to enjoy the fresh air.



**F**OR improved illumination of a room, a recent patent protects a system consisting of a color-filter mirror reflector arranged near the ceiling and a light source arranged to project a widely divergent beam against the reflector. The direct rays of the light are limited to the upper portion of the room. The reflector covers a sufficient portion of the ceiling to give off adequate illumination, from which high glare has been eliminated.



(Continued to page 54A)



# A Money-Making Opportunity for Men of Character

EXCLUSIVE FRANCHISE FOR  
AN INVENTION EXPECTED TO REPLACE  
A MULTI-MILLION-DOLLAR INDUSTRY

Costly Work Formerly  
"Sent Out" by Business Men  
Now Done by Themselves  
at a Fraction of the Expense

This is a call for men everywhere to handle  
exclusive agency for one of the most  
unique business inventions of the day.

Forty years ago the horse and buggy business was supreme—today almost extinct. Twenty years ago the phonograph industry ran into many millions—today practically a relic. Only a comparatively few foresighted men saw the fortunes ahead in the automobile and the radio. Yet irresistible waves of public buying swept these men to fortune, and sent the buggy and the phonograph into the discard. So are great successes made by men able to detect the shift in public favor from one industry to another.

Now another change is taking place. An old established industry—an integral and important part of the nation's structure—in which millions of dollars change hands every year—is in thousands of cases being replaced by a truly astonishing, simple invention which does the work better—more reliably—AND AT A COST OFTEN AS LOW AS 2% OF WHAT IS ORDINARILY PAID! It has not required very long for men who have taken over the rights to this valuable invention to do a remarkable business, and show earnings which in these times are almost unheard of for the average man.

Not a "Gadget"—  
Not a "Knick-Knack"—

but a valuable, proved device which  
has been sold successfully by busi-  
ness novices as well as seasoned  
veterans.

Make no mistake—this is no novelty—no flimsy creation which the inventor hopes to put on the market. You probably have seen nothing like it yet—perhaps never dreamed of the existence of such a device—yet it has already been used by corporations of outstanding prominence—by dealers of great corporations—by their branches—by doctors, newspapers, publishers—schools—hospitals, etc., etc., and by thousands of small business men. You don't have to convince a man that he should use an electric bulb to light his office instead of a gas lamp. Nor do you have to sell the same business man the idea that some day he may need something like this invention. The need is already there—the money is usually being spent right at that very moment—and the desirability of saving the greatest part of this expense is obvious immediately.

Some of the Savings  
You Can Show

You walk into an office and put down before your prospect a letter from a sales organization showing that they did work in their own office for \$11 which formerly could have cost them over \$200. A building supply corporation pays our man \$70, whereas the bill could have been for \$1,600! An automobile dealer pays our representative \$15, whereas the expense could have been over \$1,000. A department store has expense of \$88.60, possible cost if done outside the business being well over \$2,000. And so on. We could not possibly list all cases here. These are just a few of the many actual cases which we place in your hands to work with. Practically every line of business and every section of the country is represented by these field reports which hammer across dazzling, convincing money-saving opportunities which hardly any business man can fail to understand.

Profits Typical of  
the Young, Growing Industry

Going into this business is not like selling something offered in every grocery, drug or department store. For instance, when you take a \$7.50 order, \$5.63 can be your share. On \$1,500 worth of business, your share can be \$1,167.00. The very least you get as your part of every dollar's worth of business you do is 67 cents—on ten dollars' worth \$6.70, on a hundred dollars' worth \$67.00—in other words two thirds of every order you get is yours. Not only on the first order—but on repeat orders—and you have the opportunity of earning an even larger percentage.

This Business Has  
Nothing to Do With  
House to House Canvassing

Nor do you have to know anything about high-pressure selling. "Selling" is unnecessary in the ordinary sense of the word. Instead of hammering away at the customer and trying to "force" a sale, you make a dignified, business-like call, leave the installation—whatever size the customer says he will accept—at our risk, let the customer sell himself after the device is in and working. This does away with the need for pressure on the customer—it eliminates the handicap of trying to get the money before the customer has really convinced himself 100%. You simply tell what you offer, showing proof of success in that customer's particular line of business. Then leave the invention without a dollar down. It starts working at once. In a few short days, the installation should actually produce enough cash money to pay for the deal, with profits above the investment coming in at the same time. You then call back, collect your money. Nothing is so convincing as our offer to let results speak for themselves without risk to the customer! While others fail to get even a hearing, our men are making sales running into the hundreds. They have received the attention of the largest firms in the country, and sold to the smallest businesses by the thousands.

## EARNINGS

One man in California earned over \$1,600 per month for three months—close to \$5,000 in 90 days' time. Another writes from Delaware—"Since I have been operating (just a little less than a month of actual selling) and not the full day at that, because I have been getting organized and had to spend at least half the day in the office; counting what I have sold outright and on trial, I have made just a little in excess of one thousand dollars profit for one month." A man working small city in N. Y. State made \$10,805 in 9 months. Texas man nets over \$300 in less than a week's time. Space does not permit mentioning here more than these few random cases. However, they are sufficient to indicate that the worthwhile future in this business is coupled with immediate earnings for the right kind of man. One man with us has already made over a thousand sales on which his earnings ran from \$5 to \$60 per sale and more. A great deal of this business was repeat business. Yet he had never done anything like this before coming with us. That is the kind of opportunity this business offers. The fact that this business has attracted to it such business men as former bankers, executives of businesses—men who demand only the highest type of opportunity and income—gives a fairly good picture of the kind of business this is. Our door is open, however, to the young man looking for the right field in which to make his start and develop his future.

No Money Need Be Risked

in trying this business out. You can measure the possibilities and not be out a dollar. If you are looking for a business that is not overcrowded—a business that is just coming into its own—on the upgrade, instead of the downgrade—a business that offers the buyer relief from a burdensome, but unavoidable expense—a business that has a prospect practically in every office, store, or factory into which you can set foot—regardless of size—that is a necessity but does not have any price cutting to contend with as other necessities do—that because you control the sales in exclusive territory is your own business—that pays more on some individual sales than many men make in a week and sometimes in a month's time—if such a business looks as if it is worth investigating, get in touch with us at once for the rights in your territory—don't delay—because the chances are that if you do wait, someone else will have written to us in the meantime—and if it turns out that you were the better man—we'd both be sorry. So for convenience, use the coupon below—but send it right away—or wire if you wish. But do it now. Address

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### WHAT A DRAFTSMAN DOES

Somebody gets an idea. A draftsman is called into the boss' office. The idea is conveyed to him. He goes to his drafting table and puts the idea on paper. It may be a new kind of nut or bolt . . . even such a simple thing as that may provide weeks of good pay for the draftsman. It might be a mile-long bridge . . . a 10,000 horse-power motor . . . a new kind of elevator . . . an improved type of railroad locomotive. Right now draftsmen are working on 300 passenger airliners! It might be anything, but the draftsman has to be called in first . . . and he is.

## Become a Draftsman

READ HOW THEY EARN BIG PAY!

### GIVES BEST CHANCE FOR PROMOTION

The draftsman always works directly with the important men of the organization. It may be the superintendent . . . the engineer . . . or even the prospective buyer with whom he consults. Because he comes to know the boss so well, he usually gets first consideration when a new, better job opens up.

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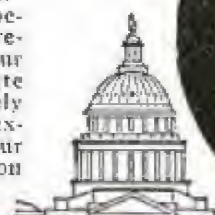
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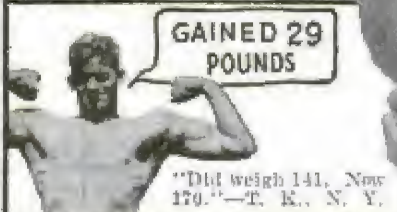
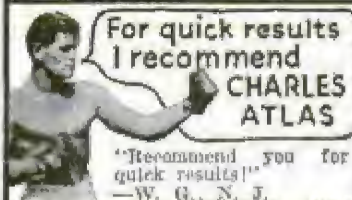
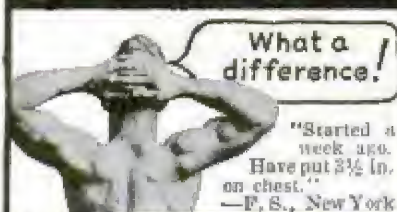
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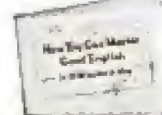


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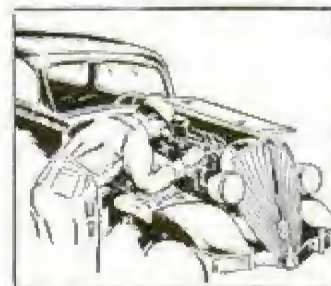
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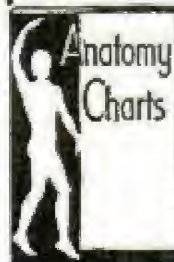


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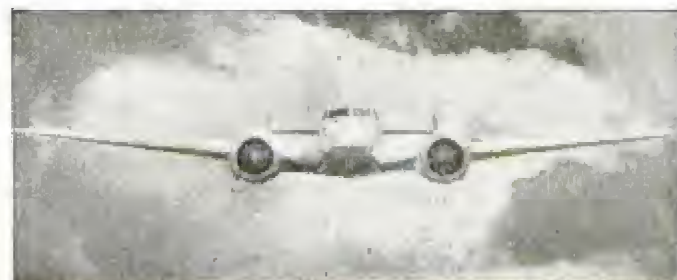
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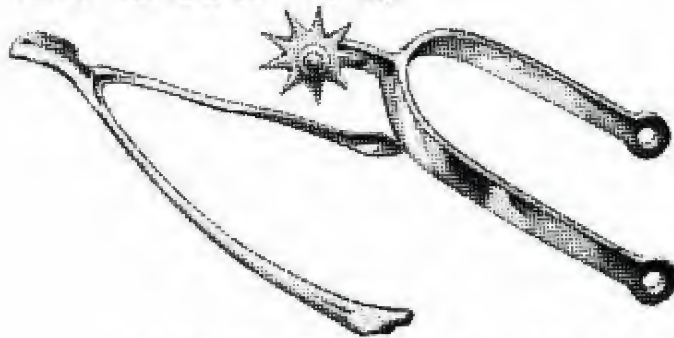
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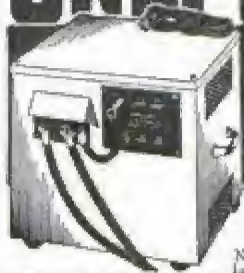
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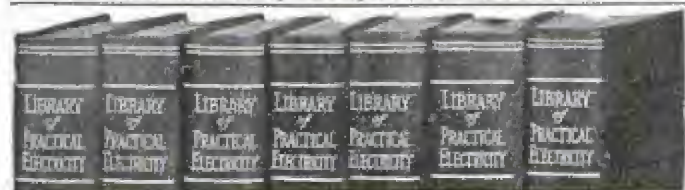
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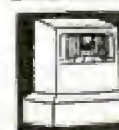
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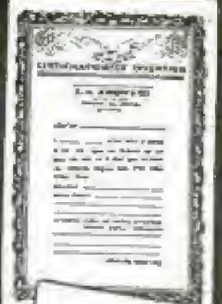
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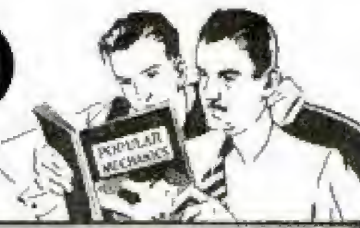
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**D.C. ARC-WELDER** Plans \$1.00. (Positively no armature winding.) Delco plan: 25-200 amperes from 32 volt Delco farm light plant. Heavy duty plan: 25-600 amperes from d.c. truck motors, etc. Dodge plan: 25-200 amperes from North-east (Dodge) 12 volt automobile generators. Welders Club of America, AB-3432 M-Mart, Chicago. Special: 44 "Lessons in Arc-welding," large book post-paid; Domestic 50c, foreign 60c. (Translated into Spanish 75c.)

**GUARANTEED** Aluminum solder. For all shops working aluminum. 50c per bar. 2 bars \$1.00. Resinger Metal Works, DuBois, Penna.

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**HIGHEST** Grade "Rubyfluid" soldering flux and solder. Old reliable brand. Special trial offer. Send \$1.00 and receive can flux, can paste, pound spool acid-core solder. You'll want more. Ruby Chemical Co., 63 McDowell, Columbus, Ohio.

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**BUILD** Miniature motors. Fascinating; educational; profitable. Details 10c. Wright Motor Works, 3256 Lake Park Ave., Chicago.

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**COMPLETE** Your own boat with our pre-fabricated frames and materials. They're different. Save 2/3s and costly mistakes. Send requirements for quotations. Illustrated catalog 100 boats, 10c. Bay City Boats, Inc., Bay City, Mich., 1552 Adams St.

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**I CAUGHT** 46 Coons last season—Have male coon hound, 3½ years old, Blue-tick-Redbone bred, large size, wide hunter, fast, good voice, true at tree, rabbit, fox, deer, stock proof, \$15.00. Ten days' trial, bank reference, picture of myself furnished. J. N. Ryan, Murray, Ky.

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**FOX,** Deer, coon hounds. Shipper 35 years. Stephens Kennels, Marshall, Ark.

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**MAKE** Money with poultry. Read America's leading poultry magazine for latest information. Three years \$1.00; nine months 25c. Poultry Tribune, Dept. E-93, Mount Morris, Ill.

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COMMEMORATIVE Half dollars: Columbus 65c; Lincoln \$1.25; Cleveland \$1.25. Bargain selling price list and California 50c gold token, 25c. Bob Cohen, Box 3507-G, Cleveland, Ohio.

"BEGINNERS Coin packet," 100 different, Colonial, United States, and foreign, \$5.00 postpaid. S. Koepfel, Merritt Bldg., Los Angeles, California.

LAST Buffalo nickel! 1938-D uncirculated, One, 15c; ten \$1.00. Oliver Arnold, 1817 Monroe, Denver, Colo.

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FREE Coin or stamp lists. 20 different Indian head cents 50c. Hussman, 211 South 7th, St. Louis, Mo.

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INDIAN Head cents—25 diff. dates, \$1.00 postpaid. Lakewood Coin Co., Box 113, Lakewood, N. J.

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BIG Prices paid for certain wanted coins. 1909 cent \$10.00, some silver dollars \$4000. 1864-1865 Indian head cents \$100.00 each, dimes before 1895, \$500; liberty head nickels before 1914, \$500; encased postage stamps; some large pennies \$2000; half cents, \$275.00; paper money, gold dollars \$1500, foreign coins \$145, some worth \$6000 each. You may have coins for which we pay big premiums. Therefore send 15c today for 1938 big illustrated coin book for certain wanted coins. National Coin Corporation (89), Daytona Beach, Florida.

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GIANT Diamond-shaped stamp! Big packet 105 all different including Alexandria (new country), Congo, Epirus, Manchukuo, Ecuador constitution, Costa Rica triangle, air-mails commemoratives; giant diamond-shaped stamp, 35 United States; set United States telegraphs, cataloging 30c. Packet British colonies including Burma (new country), jubilee and coronations; scarce Venezuela, cataloging 50c. Illustrated lists. Everything for only 5c to approval applicants! Write to-day! Mystic Stamp Co., Dept. 80, Camden, New York.

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NEWFOUNDLAND 20 Different; 50 Canada; 100 British colonies; 20c each! all three 50c to approval applicants. Westamp, 506 Oxford, London, Canada.

BEST Penny approvals. Reference. Drake, 4306 Chestnut Street, Philadelphia, Penna.

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25 DIFFERENT Peru 5c with approvals. Free hinges. Excel, Box 1315, Chicago.

25 BRITISH Colonies 3c with approval request only. Lejac, Merced, Calif.

SEND 30c For U. S. mint—Vermont, Plains, Charleston, Receive Placid free. McClay, Altadena, California.

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THE World in a packet. An outstanding value! 100 stamps from 100 different countries, including Abyssinia, Afghanistan, Brunei, Falkland, Samoa and others from Africa, Asia, South America, West Indies, etc. Our pamphlet, which tells "How to Make a Stamp Collection Properly," together with our large bargain list of albums, packets, sets, etc. All for only 20c. Queen City Stamp Co., 804 Race St., Room 36, Cincinnati, Ohio.

25 10c SETS Mint French colonials (150 stamps) \$1.00. Theron Fox, 810 Auverals, San Jose, California.

NEW Rivera nude stamp! World's largest diamond! Congo, Sudan, South Seas, bicolors, pictorials and many others. Only 3c with approvals. Cactus Junior Approvals, Box 1870-B, Tucson, Arizona.

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125 DIFFERENT Mexico, Uruguay, etc., 3c. Clark's, 3024 Lakeview, Dayton, Ohio.

U. S. "1861 to date." Big variety obsolete, plenty commemoratives, \$1.00 per thousand. Centro Philatelists, Studio Bldg., Kansas City, Mo.

WORLD'S Smallest airmail, free stamp magazine, \$2.00 U. S. airmails, bird, Indian, airplane, commemoratives, scarce stamps 25 countries, 5c with approvals. Capital Stamps, Dept. PM, Little Rock, Arkansas.

NUDE Goya 5c to approval applicants. C. Seerist, Muscatine, Iowa.

1897 GRANDE Comore, Kouangtcheouwan, Caymans, Liberian Bongo, Turks Caicos, huge Bhopal triangle, etc. Everything 3c with approvals. Viking, 1-Z, Hanson Place, Brooklyn, N. Y.

FREE: 150 Stamps with world's most beautiful approvals. Sent postage. 200 U. S. commemoratives, etc., 20c. Al. Johnson, Crescent, Colorado Springs, Colorado.

BIG Bargain! Triangles, scarce Afghanistan, St. Lucia, Vatican, Lebanon, Latin Americans, 100 different others, 10c with approvals. Shultes, Berne, N. Y.

STAMP Buyers list 10c. Loveless, 1130 East Fulton, Grand Rapids, Michigan.

CENTRAL Stamp Exchange. No dues. Write for plan, Box 671P, Wichita, Kansas.

MONTHLY Stamp and coin magazine, six months and 25 foreign stamps, 25c. American Stamp Journal, Cedar Rapids, Iowa.

1000 BETTER Mixed, 25c. Ex-Austria, wartorn China, etc. Plaza Stamp Co., Box 1161, Santa Fe, N. Mex.

APPROVAL Sheets, 1 to 3 cents, and sets. Try mine, Dorothy Leuch, 308 W. North Ave., Milwaukee, Wis.

NEW Ecuador, Salvador constitution stamps, Netherlands triangle, 10c with approvals. 100 diff. Austria 25c. 25 diff. U. S. commem. 10c. Century Stamp Shop, 104-P Fifth, Gary, Indiana.

500 U. S., 1860—1937, 150—175 Different 75c. Stratton, 435 - 38th St., Edgemere, New York.

TEN Cents brings Costa Rica cocoa, Bhopal triangle, Denmark farmers' celebration, 1923 set Irish Free State, 100 foreign to approval applicants. Searle, Box 181, Mason City, Iowa.

60 DIFFERENT Countries in packet 10c. Ralph Tanner, Red Creek, N. Y.

GERMAN Von Hindenburg burning zep-pelin (35c value), coronations from Bahamas, Jamaica, Turks, England, Ceylon for 5c with approvals. Extra! Scarce Ceylon Queen Victoria 1872 stamp, Plymouth, Dept. B36, Bell, California.

MAGNETITE Mixture—250 United States commemoratives (over 50 different) \$1.00. Waldo, Box 266, Dallas, Texas.

250 DIFFERENT Stamps including 50 different British, 15c to approval applicants. Mantle Stamp Company, London, Canada.

MEXICAN Stamps, choice quality, 100 different including airmails, commemoratives, pictorials, Dollar bill. No approvals. Irlatello, Apartado 116, Morelia, Mexico.

40,000 VARIETIES First quality stamps available on approvals, 1/4c up. Representative selection on request, adults only. PKElgwin Company, Vineland, N. J.

PAPUA Coronation set, 1-2-3-5 pence, mint 35c; used 50c. Roger Newberry, 946 Fort, Victoria, Canada.



**SOUNDS Impossible!** 120 different—Afghanistan, Azerbaijan, Zanzibar, triangle, diamond stamps; United States commemoratives, Civil War issue—\$2, \$5 high denominations; everything—5c. Abell's, 1818 St. Paul, Baltimore, Md.

**500 MIXED U. S. and foreign 10c!** Approvals. Paul Baringer, Defiance, Ohio.

**50 DIFFERENT** Denmark, pictorials, sets 1874 issues; recent commemoratives only 5c. Imperial, G. P. O. Box 130-M, New York.

**UNITED States approvals** that please. Premiums included. Dealing, Mound, Minnesota.

**300 DIFFERENT** 20c; 500, 35c; 1000, \$1.00. Spears, 934 Blake Ave., Brooklyn, N. Y.

**NEWFOUNDLAND** 20 Different 25c. Canada 100 mixed 25c. Wynn Stamps, London, Canada.

**99 ZANZIBAR**, Coronation, Tanganyika, etc., 7c. Lucky, 5018 Pernod, St. Louis, Missouri.

**U. S. Commemoratives**, 40 different, 25c. Crystal Stamp Co., Racine, Wis.

**1000 WORLDWIDE** Stamp mixture 25c. Monjar, 1542 Waverly, Cincinnati, Ohio.

**FOREIGN Approvals**, Exceptional values and selections. References appreciated. Mitchell, Box 23, Jersey City.

**FREE Triangle** to approval applicants. Far Seas Co., Box 2154, Houston, Texas.

**UNITED States** used, 35c 1000. Schiffmuller, Bellerose, N. Y.

**HIGH-GRADE** Magnifying eye-glass (jeweler's style)—50c. Segal, Box 1000, Chicago.

**50 DIFFERENT** Mint French colonials only 3c to approval applicants. Colonial Stamp Co., Lemoyne, Penna.

**HAND Painted** philatelic Christmas cards. Samples, silver quarter. Greetings, 94 Normandy, Toronto, Canada.

**U. S. Mission** mixture, 50c pound. Stamps, Box 64, Racine, Wis.

**THRILLS**. Half pound better U. S. mixture old, new issues, commems., airm., 65c. Remit any convenient way. Bargains only in better packets. Approvals, offers, the kind you like. Riebeth's, Ridgeway, Ontario.

**200 DIFFERENT** Plus 50 Chile, 25c. Approval applicants. Timor, B-589, Pasadena, Calif.

**APPROVALS**. One, two, three cents. Sets ten cents. Charles, 506b Jones, Detroit, Michigan.

**FREE Stamp**. No approvals. Send postage. Fanter, 5452 Robin, St. Louis.

**SCARCE** Canada \$10.00 stamp with approvals 10c. Odias Demers, Sanford, Maine.

**FREE—Five** British Colonials, 100 different from 100 different countries 25c. 200 different 20c. 300—25c. 500—50c. Charles, 506a Jones, Detroit, Michigan.

**PRODIGIOUS Gift!** Fantastic Indochina, German state, savage Somalicoast, Perak, Selangor, Negri Sembilan, bicolored banana airmail, Siberia. Absolutely free with approvals. Postage 3c. Saxon Company, 408-A Jay St., Brooklyn, N. Y.

**25 DIFFERENT** U. S. commemoratives, 15c and postage. Scranton Stamp Service, 307 Tenth, Scranton, Penna.

**U. S. Constitution** stamp of Ecuador. Gorgeous 6-color stamp showing the U. S. flag in natural colors and George Washington; also beautiful new King George VI Cayman Islands, fine dragon stamp (catalogs 12c alone), Gen. Franco Spanish Morocco "war stamp," 70-year-old North Confederation issue, largest diamond-shaped stamp, attractive tropical triangle stamp, odd Chinese "midget" stamp, and many others will be found in our Marvel packet of 33 all different, genuine stamps for only 5c to approval applicants. Potomac Stamp Co., Dept. 111-D, Washington, D. C.

**150 U. S. Commemoratives**, etc., 25c; 500, 55c. A. Grove, 306 Blanchard, Seattle, Washington.

**WILL** Buy stamp collections. U. S. stamps preferred. W. W. Miller, Box 425, Lawrence, Kansas.

**300 MALDIVE** And Ceylon with higher value pictorials galore \$1. As received from offices here. World's greatest stamp bargain ever offered. Ribbons, Balangoda, Ceylon.

**U. S., Canada, Newfoundland, Mexico:** "Four Star approvals." Nothing like them! Write today. 312 mixed U. S. only 10c. Kessels, Tucson, Arizona.

**UNITED States approvals**. Write for selection on approval. 19th century airmails, revenues. No premiums but good stamps, fast service. John Daub, Wabash Bldg., Pittsburgh, Penna.

**GENEROUS Offer:** Big packet stamps including scarce North Ingermanland, Comoro Islands, Afghanistan, triangle, old Tasmania and over 100 different others. Everything only 10c to approval applicants. Helken, Benson, Ill.

**75 DIFFERENT—All British—only 10c** with approvals. Crescent Stamps, London, Canada.

**FREE Ace** bargain card of outstanding values. Send for it today. Ace Stamp, Colonial Arcade, Cleveland, Ohio.

**EARN Cash-stamps**, sell my approval books. Nickel packets. Ellison, 2841 West 37th St., Brooklyn, New York.

**BEAUTIFUL Irish girls**. Second set of souvenir stamps issued by Irish Hospitals' Trust Limited, Dublin. Specimen sheet of 20 stamps supplied free of charge to all writing to Mr. J. O'Sheehan, Department PM, 28 Earlsfort Terrace, Dublin, Ireland.

**FREE**. 50 Stamps, Manchukuo, etc. Postage 1c. Album 3c. Bullard, 268 Northampton, Boston, Mass.

**FREE! Triangle airmail!** Diamond! Pictorials! British Colonies! Wonderful packet 106 different, 5c to approval applicants. Bargain Co., Box 39P, Times Square Station, New York.

**SMALL Sheet** of 4 different triangles 10c to approval applicants. Victoria Stamp Co., London 4, Canada.

**FREE—\$1 U. S. stamp** with request for 52 page list of United States and foreign stamps. Stamps on approval. References necessary. 20 different nineteenth century U. S. 28 cts. New Hussman Stamp Co., 1122 Pine, St. Louis, Mo.

**300 DIFFERENT** Stamps 20c; 600, 50c; 1000, \$1; 2000, \$3; 3000, \$7. Fred Onken, 630 79th St., Brooklyn, N. Y.

**UNBELIEVABLE!** 62 Different, six triangles and diamonds; airmail, animal, war stamps—China, Japan, Manchukuo, insurgent Spain; Asia, Africa, South Seas. Everything, 5c! Crowder's, 127E North, Baltimore, Md.

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**ILLUSTRATED U. S. list**, price 50c, large complete U. S. price list free. Send postage. Stanley Gibbons, 38P Park Row, N. Y.

**PENNY Approvals** that please. Haywood, 395 Adams St., Pomona, Calif.

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**STAMPS**. A superb selection sent on approval. Quality at low prices. Fred Herzberg, Box 91-P, Elmhurst, Ill.

**QUEEREST Stamps packet**. Receive one of world's smallest stamps; scarce Vatican City; Greek Red Cross (coiled snake in Garden of Eden!); Manchukuo; South (mountain lion); Mozambique (giraffe); Palestine; many others. Also big packet 25 dif. Japan, (including earthquake stamp) and pkt. 15 dif. China. Everything for only 5c to approval applicants! R. M. Stamp Co., Box 230P, Port Chester, N. Y.

**50 DIFFERENT**, Fine U. S. including perforation gauge, 10c with approvals. The Stamp Shop, 809 Holland Bldg., St. Louis, Mo.

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**ASK** For our wonderful one cent approvals. Prospect Stamp Co., 225 Broadview, Toronto, Canada.

**WHOLESALE Catalog** for dealers. Illustrated. Postage 5c. Frank Co., 4900 Chalmers, Baltimore, Md.

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**30 DIFFERENT** Angola, Cape Verde, Guinea, Portugal, Mozambique, St. Thomas and Prince 5c. Approvals. Depraw, Ocean Park, Calif.

**STAMP Dealers**, your ad here will bring wonderful returns. Ask me for proof. F. W. Johnson, Manager, Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

**APPROVAL Sheets**. One to three cents. Frederick B. Driver, 2009 Finance Bldg., Philadelphia, Penna.

**25 UNITED States**, including \$4 and \$5 stamps free to approval applicants. 3c postage. Brownie Stamp Shop, Flint, Mich.

**WEEKLY** Stamp magazine, thirteen weeks, 10c. Stamp Journal, Kalamazoo, Mich.

## HOBBIES AND COLLECTIONS

**COLLECTORS**. Liberty Bell paper-weight novelty, 30c. Joseph Winters, Pleasantville, N. J.

**DO** Gem polishing as a hobby. Book on bench construction, etc., \$1.00. Smiths Agate Shop, 228 W. Adler St., Portland, Oregon.

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**LATEST Hobby—Chemical gardening**. Grow fruits, flowers, vegetables, year round indoors, outside. Combine pleasure with profit. Chemicals, instructions, formula, bibliography \$1.00 postpaid. Chemi-Culture, 4701-MP Sheridan, Chicago.

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**35MM.** Rolls fine grain developed free, 36 enlargements, 3½"x5, \$1.00. Photoshop, Linton, Ind. Cartridge reloaded 35c.

**PHOTO Mill**. Immediate service! No delay! Roll developed, carefully printed and choice of two beautiful 5x7 double weight professional enlargements, one tinted enlargement, or eight reprints—for 25c coin. For sample Christmas card send negative and five cents. The Photo Mill, Box 629-12, Minneapolis, Minnesota.

**JOB Hunters!** Enclose your photograph with every letter, inexpensively. Employers demand them. 100 glossy prints \$1.00. Postal Pictures, 1895 Belmont, East Cleveland, Ohio.

**PERSONAL** Photographic Christmas cards, calendars. Illustrated circular free. Ideal Photos, Box 2255, Paterson, N. J.

**15c—15c ROLLS** Developed with two prints of each exposure or eight prints and two enlargements 15c. Trial. Superfine Finishers, Maywood, Illinois.

**35MM. ROLLS** Fine grain developed, 1 Jumbo print each shot, \$1.00. Square Deal Studio, Dept. M, Huntington, Ind.

**MAIL** Your rolls to film center of the world. Any 6 or 8 exposure roll developed and printed 25c coin. Deluxe enlargement coupon free! Photo Finishing Shop, Est. 23 yrs., 411-AA Genesee Valley Trust Bldg., Rochester, N. Y. "The Camera City."



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**20 REPRINTS 25c.** Films developed, two prints each negative 25c. Skrudland, 6970-8 George, Chicago.

**SENSATIONAL Offer.** Five 5x7 enlargements 29c. Eight candid enlargements, 3x4½, 25c. Cardinal Photoers, Summit, N. J.

**CHRISTMAS Cards** from your own negatives. Five cents each, including envelope. Film Capital Service, Box 504, Rochester, N. Y.

**LIFE Prints last a life time.** Roll developed, 8 prints, 2 pleasing enlargements 25c. Any size reprints 2c each. Life Photo Co., Hutchinson, Kansas.

**CANDID Special.** 35mm. rolls enlarged to 3¼x4½, \$1.00. 18mm. rolls 60c. 3¼x4½ reprints 3c. Brown Photo Company, 1910-61 Emerson, Minneapolis, Minn.

**ROLL Developed,** two sets prints 25c. Wilkes-Barre Photo Service, Box 64, Wilkes-Barre, Penna.

**TWENTY Reprints 25c.** Rolls developed and two prints each negative, 25c. Send for free mailing envelopes, price list. Star Photos, 109 N. Dearborn, Chicago.

**CANDID Camera fans**—36 exposure films developed, printed 50c. Fine grain development and enlarged 2½x3½, \$1.25; 3½x5, \$1.50. Orco, Upper Sandusky, Ohio.

**35MM. FILM Developed** special ultra fine grain process and each good frame enlarged to 3½x5 on Kodabrom. All for \$1.00. Free 8x10 enlargement with every \$2 order. Walter-Newman Laboratories, 90 Fountain Ave., Brooklyn, New York.

**BUFF-TONE Enlargements.** From your treasured photo, snapshot, or negative, 5x7, 25c; 8x10, 50c. Originals returned. Marcin Photo Service, 84M Armbruster, Buffalo, N. Y.

**ENLARGEMENT**—Of each picture on your roll 25c. Cut Rate Photos, Janesville, Wis.

**ROLLS Developed,** 8 prints, 5x7 coupon 25c; 8 reprints, 5x7 coupon 25c. Weicks, 2840 Zenobia Street, Denver, Colorado.

**IMMEDIATE Service!** Better pictures. Sixteen guaranteed prints from roll, 25c. One colored or two plain enlargements and 8 guaranteed prints 25c. Sixteen reprints only 25c coin. Candid rolls developed free! Prints enlarged to 3x4, only 4c each. One day service. Details and mailers free on request. American Studios, Box B, LaCrosse, Wis.

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**KODAK Rolls developed,** 8 glossy prints 25c. Reprints 3c. Receive beautiful frame folder with 25c order. Franklin Studio, F-1, 1416 Ogden, St. Louis, Mo.

**16 PRINTS With roll 25c.** 16 reprints 25c. Rex Photo, Ogden, Utah.

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**MILLIONS Now know "Hollytints Means Better Prints."** Two professional enlargements with trial roll—25c. Fascinating premiums. Unequaled service. Hollytints, P-1350, Hollywood, California.

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**35MM. ROLLS** Fine grain developed and each shot enlarged to 3½x5½, \$1.00. Ideal Films, Birmingham, Ala.

**EXPERT Photo finishing.** One day service. 8 genuine expensive Velox prints, two double weight professional enlargements 25c. Expert Studios, LaCrosse, Wis.

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**ROLL Developed with 16 Velox prints,** 25c. Eastern Photo, Milford, Conn.

**ROLL Developed,** 8 brilliant fadeproof Velox prints and two professional enlargements 25c. Embossed photo Christmas cards or calendars from your negatives, 4 for 25c, envelopes included. Overnight service. Young Photo Service, 405-C, Albany, N. Y.

**BEAUTITONE Enlargement,** dime and negative. Giant Snapshots, Inc., Green Bay, Wis.

**SPECIAL Trial!** Rolls developed and printed with wide border deckle edge prints only 15c. Quality guaranteed. Deckleton Finishers, 6444 Diversey, Chicago.

**GUARANTEED.** Roll developed, 16 prints 25c. 20 prints 25c. Quality Photo, Hutchinson, Kansas.

**QUICK Service**—Rolls developed, 8 guaranteed prints; 2 enlargements; 25c coin. OK Photo Service, Ottawa, Kansas.

**ROLLS Developed and printed 10c.** Trial. Quality Finishers, Maywood, Ill.

**ROLLS Developed,** 8 prints, 2 enlargements, 25c. Mayfair, Box 261-K, Toledo, Ohio.

**PROMPT Service**—Quality work; 2 beautiful double weight gloss enlargements, 8 guaranteed neverfade prints each roll, 25c. Excel Photo Service, Dubuque, Iowa.

**WILLARD'S** Gives your pictures a beauty treatment—they're clear, brilliant, full of life. Roll developed, 2 prints each negative 25c. Enlargement coupon. Willard's, Box 3535-A, Cleveland Heights, Ohio.

**ROLL Developed,** 16 guaranteed prints 25c. Smart Photo, Winona, Minnesota.

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**PROMPT Service!** Rolls developed, two Velox prints each negative 25c. Hench Studios, Harrisburg, Penna.

**ROLLS Developed,** two sets prints plus enlargement coupon 25c. Reprints 3c. Over 19 reprints 2½c. Jones Studios, Davenport, Iowa. "Where the West Begins."

**ROLLS Developed,** 2 prints each and 2 free enlargement coupons, 25c; reprints, 2c each; 100 or more, 1c. Summer's Studio, Unionville, Mo.

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**GOOD Used cameras:** Eastman view, Rolleiflex, Linhof, Ansco, Elwood enlarger. Tripods. Descriptive list for stamp. H. R. Johnson, Desk M, Baltimore, Ohio.

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**BEST Prices 8mm.-16mm.** Write, Pennsylvania Photo, Box 423-A, Williamsport, Pennsylvania.

**SIMPLEX** Fading glass—fade-in, fade-out effects. \$2.00. Reynolds, 165 East 191, Cleveland, Ohio.

**TALKIES.** 16 And 35mm. Complete show. Rental \$7.00 per week. With projector \$22.50. List free. Motion Picture Exhibitors, 3865 West 25, Cleveland, Ohio.

**WRITE** For our new free 16mm., 8mm. bargain lists. Home Movies, Box 216, Easton, Pennsylvania.

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**USED Bargains:** 400' 16mm. reel and can 35c; 1600' \$1.39, with can \$2.69. Victor 16mm. camera \$3.5 \$34.75. Capital continuous 16mm. projector 400', 500w with translucent screen \$45.00. Moviematic camera \$2.89, film 88c. 35mm. DeVry, regular \$675.00, sound film projector, amplifier, speaker, complete for use \$185.00. Home talkie turntable outfit, new, complete \$7.85. 16mm. 100' comedies, etc., \$1.25. 400' \$6.50; sound \$10.00. Features \$65.00. Religious. Rental films 8-16mm, sent anywhere; lowest rates. Catalogue. Largest variety photographic, movie equipment. Trades accepted, bought. Mogull's, 64 West 48th, New York.

**BEADED Screens,** 30"x40"—\$3.00. Make own screen—beads only, \$1.00 lb., postpaid. Illinois Mail Order, B-15, Oak Park, Ill.

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**FORMULAS**—Fast selling products. Guaranteed. Laboratory tested. Any formula 50c, three \$1.00. Franklin-Allen Laboratories, South Paris, Maine.

**THAXLY** Formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. B. Thaxly Co., Washington, D. C.

**FORMULAS:** 15 Proven moneymaking formulas \$1.00. (Not stock-formula catalogue stuff), real unusual offers. List free. Marvel Laboratories, 6629 No. Maplewood, Chicago.

**FORMULAS.** Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

### CHEMISTRY

**CHEMICALS.** Laboratory glassware, apparatus. Send 3c for catalog CP1. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

**FREE** Survey of your problem. Formulas. Research-Testing Chemists Laboratory, 701 Hickory, Joliet, Illinois.

**CHEMICALS.** Laboratory glassware, apparatus. Send 3c for catalog CP1. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

**ANALYSIS.** Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CT-1142 Sunnyside, Chicago.

**PERSONAL** Prompt answer by chief chemist to any technical question. Expert advice on engineering problems by qualified engineer. Absolutely confidential. Patent protection service. Our technicians regularly consulted by America's leading industries. Send \$1.00 with your question. Technical Service Bureau, Laboratory 24, 6803 North Clark, Chicago.

**FREE** Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

**TELESCOPES.** Microscopes, chemistry, mineralogy. Scientific catalog free. Tracey Laboratories, Evanston, Illinois.

### AGENTS WANTED

**SELL** Security gold bronze lifetime card. Sells 35c costs 5c. Latest, best moneymaking opportunity. Profits all yours. We supply complete equipment, 100 gold bronze plates including marking tool, \$12.50. Extra plates \$5.00 hundred. Sample 15c. Order direct from this ad. Information free. Machinery Sales, B-192 N. Clark, Chicago.

**LEADING** Shoe manufacturer, established 35 years, is enlarging national sales organization. Big money-making opportunity for sincere men. No experience needed. Everything furnished. Complete line of 300 styles for men and women, including free demonstrator of famous Velvet-Eez air-cushion nailless insole shoes. Prices low as \$1.98 pair. Write Mason Shoe Manufacturing Co., Dept. B11, Chipewa Falls, Wisconsin.

**80-PIECE** Christmas box, costs you 25c. Sells quickly at 50c. 16 new French-fold greetings; 16 envelopes; 48 Nip-Apart seals in handsome colors; 80 pieces in all. Get sample set on approval; also new 3-way plan on personal greetings, etc. American Card Co., Dept. B-95, Lancaster, Penna.

**AT** Home, your own manufacturing business, making popular \$1 novelties. Cost you 3c to 15c. Everything supplied. Write So-Le Works, Dept. L-642, Cincinnati, Ohio.

**CHRISTMAS** Cards. Earn \$2 hour. Take orders galore from friends. 50 exquisite folders with name at \$1. Free album 18 designs. Fastest selling 21 folder box in America. Costs 50c. Sells \$1. Request samples. Sunshine Art, Dept. E, 154 Nassau, New York City.

**LARGE** Profits selling Magic Fluid. Repairs instantly any fabric or rubber, heat and laundry proof. Eureka, 1911 S. Wabash, Chicago.



**PARING Knife.** New. Peels, slices, cores. 200% profit. Sample 10c. Also 3 other new quick-selling household necessities. Apex Specialty Co., 400 Dakota Bldg., St. Paul, Minn.

**BLACK Walnut cracker** \$2.50 prepaid. Pecan cracker \$2. Agents wanted. Money back guarantee. Clark Nut Crackers, Harrisburg, Penna.

**MAKE Quick profits** demonstrating unique invention of electric bulb. A bright reading and current saving night light all in one. For free details and sample offer write Hagen Import Company, St. Paul, Minn.

**NEW, Powerful aid** in building business on Harding's "Linoleum Renu-Wax." We print your name on package and on free circulars. You get repeats, big profits. Details free. Harding Products, Harding Building, Worcester, Mass.

**JO-BO Rubber bow neckties.** To show them is to sell them. Good sideline. Jo Bo Products Co., 3402 School, Des Moines, Iowa.

**AGENTS—Opportunity make money;** book containing 107 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

**ABLE Men** to distribute advertising circulars and handle routes. Make up to \$42.50 first week. Brand new Ford sedans given producers as bonus. Details free. Albert Mills, 6273 Monmouth, Cincinnati, Ohio.

**EARN Cash quick.** Sell double value Christmas cards, 1938 leaders. Personal cards, stationery, box assortments. Season's most complete line. Profit up to 100%. Experience unnecessary. Free samples. Wallace Brown, 225 Fifth Ave., Dept. 71-E, New York.

**SELL Best canned coffee.** Samples free. Ortiz Olaya, San Juan, Puerto Rico.

**SELL Manufacturers, jobbers, merchants.** Steady income. Immediate earnings. Jacolac Decalcomania Co., 1315 South Ashland Ave., Chicago.

**BE Your own boss!** Operate used-new clothing business from store, home, auto. Up to 300% profit. Everything furnished. Catalog free! Portnoy, 566-AL Roosevelt, Chicago.

**MAN Wanted** to supply Rawleigh's household products to consumers. We train and help you. Good profits for hustlers. No experience necessary. Pleasant, profitable, dignified work. Write today. Rawleigh's, Dept. K-53-PPM, Freeport, Ill.

**BUSINESS Proposition:** Restilvering mirrors, autoparts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 128 Marion, Indiana.

**DISTRIBUTORS Wanted.** Our products put dollars in your pocketbook. D. Hemingway, Oak Knoll Road, Natick, Mass.

**MARVELOUS New toy.** Big 10c seller, 300% profit. Write immediately. Sample free. Send quarter for packing, mailing. General Supply Co., Dept. 618-PM, Piqua, Ohio.

**500% PROFIT** With new perfected (1938) quick-action, no flint, automatic gas lighter. Retail 25c. Sample 5c. New Method Co., Box PMQ-71, Bradford, Penna.

**AGENTS Make big profits** on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2810-R Dodder, St. Louis, Mo.

**MEXICAN Novelties!** 100%-300% profit. Free particulars. Samples 10c stamps. Marquez-PD, Apartado 1176, Mexico City.

**GOOD Eyesight** without glasses. No drugs. Representatives wanted. Particulars 10c. Arthur Jacobson, Upsala, Minn.

**500% PROFIT.** Modernistic guaranteed stick-on letters for windows, offices, trucks. Large sizes 1c. Easily applied by agents or customers. Free samples. Modernistic, B-3004 Lincoln, Chicago.

**DAZZLING, Sparkling.** 5 color match books sell on sight. Big commissions. Bonus plan. Write today! Perfect Match, B-11, Oak Park, Ill.

**AUTO Back-up light.** Powerful, automatic. Sells \$2.95. Sample, \$1.95 prepaid. Give make, year. Century Products, Box 127, Racine, Wis.

**PATENTED Leather keycase** gives right key without looking. Samples three styles 25c. Mercer, 101 W. 76, New York.

**SELL Etched metal, life-time social security cards.** Earn \$5.00 a day, 60% commission. Retain present job. William Hament, 665 West Lexington St., Baltimore, Md.

**EVERY Man needs shirts!** He will gladly buy from you when you offer choice of 90 sizes for customized fit, huge selection and sensational one year guarantee backed by 45 years of shirt making experience. Half price offer creates terrific values. Repeat orders give permanent income. Simply write orders, we'll deliver prepaid and collect. World's largest concern of its kind. We paid over \$100,000 commissions past year. Get your share! Big cash commissions daily, cash bonuses regularly. Experience unnecessary. Complete self-selling outfit free. Write quick to Dept. 134, Roscliff-Quaker Corp., 1239 Broadway, New York.

**PROFIT 33-1/3%** Selling items every store, school prospect. Write for information. 25c brings illustrated catalog. Simons Service, Suite 1958, 608 So. Dearborn, Chicago.

**BALLGAMES, Movies** afternoons. Work mornings home, your own business. Introductory booklet free. Stamford, 3762-F Broadway, New York.

**BIG Profits** selling our guaranteed hoisery. Write immediately for free sample offer. Ortiz Olaya, San Juan, Puerto Rico.

**90c PROFIT** Every dollar. Year's biggest money-maker. Sell "Go Sunday-School-Church seals." Be smart. Send 25c for \$2.00 worth and guaranteed selling plans. Now. Box 153, Reading, Penna.

**AGENTS-DISTRIBUTORS.** To mail sample herbs and literature in their territory. Establish profitable trade. Samples particulars free. Kendall Company, 155M Lake, Elmira, N. Y.

**FAST Selling Christmas specialty.** Big profit. Rotex, Box 1123P, Wilmington, Del.

**CHRISTMAS Cards—50 beautiful folders,** name imprinted, cost you 65c, sell for \$1.00. Also marvelous box assortments, 100% profit. Samples free. Write! New England Art Publishers, North Abington, 258, Mass.

**30-50% COMMISSION** Ladies', men's hosiery, underwear, slips, Hooverettes, shirts. Bargain prices. Free outfits. National, 1123 Broadway, New York.

**EXCLUSIVE Representations** conferred. Revolutionary faucet water softener. Luxosoft, Sausalito, California.

**FREE Catalogue,** razor blades, notions, household specialties. Lowest wholesale prices. Warrenfelt Supply Co., Indianapolis, Ind.

**MILLER'S Certified formulas** produce latest recognized products! Research messenger—Money-making information, free! Miller, Chemist, Tampa, Florida.

**BIG Profits! Repeat business.** Fast selling necessity, sells 2 oz. 25c. Send \$1.00 for formula, information. Spy, 119 North Tejon, Colorado Springs, Colo.

**PROFIT** With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1143 Sunnyside, Chicago.

**PROFIT** Up to 100% with our distinctive calling cards. Samples free. Universal, Orange, Massachusetts.

**\$192—K's WEEKLY Earnings.** Above average, but maybe you are too! 205 money-making plans. Introductory booklet free. Stamford, 3762-e Broadway, New York.

**NEW Potato peeler.** Sells like wild. Peels, shreds, slices, grates. Saves hands, time, food. Samples sent on trial. Rush name. Kristee, 107, Akron, Ohio.

**AGENTS: Surprise Christmas package** modern metal toys—Train, aeroplane, etc. Selling 15c to 30c each—50c postpaid. Write immediately. W&W Toy Co., 13530 Miles, Cleveland, Ohio.

**BIG Money** taking orders: shirts, ties, hosiery, underwear, raincoats, pants, dresses, etc. Sales equipment free! Experience unnecessary. Write Nimrod, 4922-AN Lincoln, Chicago.

**MONOGRAMMING** Automobiles real money maker. Write for samples. International Co., Box 9360, Philadelphia, Pa.

**"KEENEREDGER"** Produced 750 smooth shaves from one blade. Sample \$1.00. Keeneredger, Oblong, Ill.

**SUCCEED** With your products. Make-sell them. Formulas, Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

**PERFUME Concentrate.** Big profits, quick sales. Pleasant work for ladies and gentlemen. Free carded odors. Persian Perfume Company, 1231 Olive, Desk 12, St. Louis, Mo.

**CHRISTMAS Card box assortments** selling like "wildfire." People who have never sold a thing in their lives are reaping harvests with our sensational 21 folder "Champion" assortment. Costs 50c—Sells for \$1.00. Also amazing etchings, gift wrappings, religious, humorous and everyday assortment. Write today. Samples on approval. Silver Swan Studios, 320 Fifth Ave., Dept. 74, New York.

**SANTA Claus** card talks like phonograph, speaks the greeting, Merry Christmas. Sensational seller. Sample 10c. Talking Card Company, 4451 Irving Park Blvd., Chicago.

**STARTLING Invention—Pocket adding machine.** Nationally advertised \$2.50. Whirlwind seller. Big profits. Baby Calculator Co., Box 1118, Chicago.

**AGENTS:** Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 8 1/2c. Razor blades 10 for 8 1/2c. 100 sticks chewing gum 12c. Christmas cards, 21 in box 14c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO. St. Louis, Mo.

**DO You want agents** for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

**BIG Money** applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

**BIG Money** applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1305 Washington, Boston, Mass.

**500% PROFIT!** Gold and colored sign letters for windows, offices, trucks, signs. Auto monograms. Easily applied by agent or customer. Neonite, Akron, Ohio.

**AGENTS—To mail** our literature. Good profits. Home business. Maywood, 149 Fifth Ave., New York.

**FREE Sample—Amazing cleaner;** sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

**AGENTS: Stamping names** on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-books, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

**MANUFACTURE Specialties,** hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-F Broadway, New York.

**ENGRAVED Name plates,** numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

**REVOLUTIONARY Window cleaning tool.** Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

**BIG Profits.** The perfect eyeglass cleaner. Wonderful demonstrator. Prevents steaming. Sample 15c. Shurberg Chemical, Hartford, Conn.

**GUARANTEED Gold leaf** letters for store and office windows. 300% profit. Free samples. Metallic Co., 438-B N. Clark, Chicago.

**ATLAS Window sign letters.** Large sizes, penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

**WANTED—District purchasing agents.** No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

#### HIGH-GRADE SALESMEN

**SELL America's most complete line** of business necessities. Regular and novelty size book matches, gummed labels, political items, pricing sets, restaurant supplies, salesbooks, embossed stationery, shipping supplies, office supplies, printed gummed tape, advertising pencils, thermometers, business stimulants, holiday novelties, sensational line of calendars and greeting cards at new low prices. Complete line printed business forms and hundreds of other fast sellers. Undersell all competition. Cash commissions advanced daily, extra bonus. Experience unnecessary. Complete sales outfit free. Federal, AV-301 South Des Moines, Chicago.

**SALESMEN! Collect \$3.00 profit** from every service station and garage. New invention revolutionizing industry. Airpower Co., Newton, Iowa.



**AMAZING** Invention closes all doors silently, automatically. New oil principle. Easily installed. Never needs attention. Priced dollars less than other checks. Unlimited market, stores, offices, factories. Free demonstrator furnished workers. Kant-Slam, Dept. E-62, Bloomfield, Ind.

**SELL** Business cards \$1.50 thousand. Business stationery. Xmas cards, calendars, book matches, advertising tape, paper towels, pencils, salesbooks, rubber stamps. Free sales portfolio. 35% comm. daily. Money making specials. David Lionel Press, 312 So. Hamilton, Dept. BC, Chicago.

**NATIONALLY** Patronized for years. Simplest, complete record book, full social security schedules, with or without expert preparation, federal income tax returns. Largest profits. Federal Income & Audit System, Inc., 1406 G Street Northwest, Washington, D. C.

**1000 SPARE** Time salesmen wanted by largest nurseries in world, nearly 125 years old. Healthful outdoor work. Cash income weekly. Many making \$50.00 in week. You can do as well. No cash or experience needed. Write quick for free sales making outfit and weekly income plan. If you can't sell, buy Stark trees. Write for catalog of highest quality trees, shrubs, roses, etc. Stark Nurseries, Box C-8118, Louisiana, Mo.

**SELL** Candidates! No competition. Unaffected by "recession." Most complete line of auto-signs, posters, novelties on market. Also investigate our new Art-Plax line of thermometers, silhouettes, mirrors. Ad-Nov-Co, Newton, Iowa.

**CHRISTMAS** And calendar bargains! Catalogue free! Twenty-one piece boxes 15c; twelve pieces 8c; fifty imprint folders 25c. More profits! Easter sales! Elfko, 436 North Wells, Chicago.

**MOST** Popular air vacuum car cleaner on market \$7.85. Superior to \$75.00 cleaners for autos. Beeman Co., Denver, Colo.

**MORE** Than 100% profit selling Dominion Ribbon Renewer to every owner of typewriters, cash registers, adding machines, etc. Dominion Specialties, Dinmore, Sask.

**EARN** Big money selling social security bronze plates. Send 15 cents for bronze sample. Burel & Company, Inc., 679 Orleans, Chicago.

**SALESMEN**, Distributors—200 items, brushes, mops. Marvelous magnetic brush excels vacuum cleaner, big profits. Neway Brush Co., Hartford, Conn.

**\$50 WEEKLY** Possible from start placing nationally advertised counter card goods with stores. Chance to double earnings in few weeks. Most unusual selling opportunity in wholesale field. Permanent connection. World's Products Co., Dept. 1110-A, Spencer, Ind.

**POPCORN** Machines, caramelized, crisp-ettes, cheese coat, potato chips. Long Eakins, 2035-L High St., Springfield, Ohio.

**MAKE** More money! Selling a line no one else has! New and different radios, quick selling electrical appliances, attractive gift items. Write for new catalog. Hart Products, 168 West Jackson, Chicago.

**MAKE** Big daily profits selling Top Quality Advertising Book Matches. Low prices. Experience unnecessary. Full time profits unlimited. Free sales kit. Zipper case offer. Match Corporation of America, Dept. E-11, 3433 West 48th Place, Chicago.

**BIG** Commission selling celluloid pricing tickets, metal shelf moulding, menu covers, changeable signs, celluloid advertising buttons. P. Pricing Press, 124 White St., New York.

**BRUSH** Salesmen—If you ever sold brushes write for our money making proposition. Donald Brush Co., Dept. P.M., Camden, N. J.

**NO-CO-RO** Definitely insures automobile batteries against corrosion. Place three color display cards service, filling stations. Big profits; exclusive territory. No-Co-Ro Company, Oakland, California.

**SALESMEN**: Agents. Unlimited money-making possibilities selling our high-grade, guaranteed line of diamonds and watches. No investment, no competition. Cash commissions daily. Protected territories available for ambitious, alert, responsible salesmen with followings. Write today for information. R. A. Press, Inc., 812 Sansom Street, Philadelphia, Penna.

**SALESMEN**, Mail order men handle line mimeograph supplies. Big commission. Economograph, 39 West Adams, Chicago.

**FAST** Selling hairdressers' record system, 50% commission, C&S, 581 Boylston Street, Boston.

**EXCELLENT** Opportunity selling our complete line of brushes, largest commissions. Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

**SEE** Our advertisement under Agents Wanted for free money-making outfit. Roschiff-Quaker, 1239 Broadway, Dept. 134, New York City.

**SALESMEN**—Managers wanted in every city. Sell all business, professional men. No dull seasons. Big profits! Sayers System, 2805 Sheffield, Chicago.

**TIRE** Accessories. Guaranteed 10,000 mile Tiger Grip Tire Patch, and complete fast-selling line auto accessories. Salesmen-distributors easily make up to \$75 weekly, and over. Protected territory. Economy Rubber Products Co., 646 Burkhardt, Dayton, Ohio.

**AUTOMOTIVE** Salesmen! Distribute auto product needed by millions. Up to 500% profit. Information free. Thermo-Works, Peoria, Ill.

**205 "RECESSION** Plans"—opportunities to make up to \$75 weekly, today's conditions. Introductory booklet free. Stamford, 3762-g Broadway, New York.

**BIG** Money taking orders; shirts, ties, hosiery, underwear, raincoats, pants, dresses, etc. Sales equipment free! Experience unnecessary. Write Nimrod, 4922-AP Lincoln, Chicago.

**SELL** New Hexagon portraits. Big profits. Lowest prices portraits, frames. Catalogue free. Picture-Man Friedman, Dept. 9, 538 Cornelia, Chicago.

**SALESMEN**—Sell calendars, complete line, all sizes, including jumbos; beautiful subjects. Samples free! Fleming Calendar Co., 6539 Cottage Grove, Chicago.

**NEW** Specialty—Sells every business and professional man. Four \$15 sales daily pay \$380 weekly. Farrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

**GUARANTEED** Gold leaf letters for store windows. Free samples. Liberal offer to car owners. Metallic Co., 438-A N. Clark, Chicago.

**MAKE** More money with Red Comet Automatic Fire Extinguishers. Low price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 704 Red Comet Bldg., Littleton, Colo.

#### HELP WANTED

**WEAR** Fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, Desk 37-K, Greenfield, Ohio.

**EXECUTIVES**—If you are now earning over \$2500 yearly, can prove it and seek a promotion or change, our strictly confidential service, hiding your identity, locates higher-bracket salaried openings in your behalf. Write fully Executive's Promotion Service, 303 B-st., S.E., Washington, D. C. (Note: sales agents wanted.)

**INSTRUCTION**—Obtaining positions, homework. Free offers. Henry, 126-B Lexington, New York.

**EXECUTIVES**—Let us show you how to get high class salaried employment fitted to your training and experience. Executive's Promotion Service, 300 B-st., S.E., Washington, D. C.

**STEADY** Work—Good pay. Reliable man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Make up to \$12 a day. Wonderful new proposition. Particulars free. Write McNess Co., Dept. 216, Freeport, Illinois.

#### EDUCATIONAL AND INSTRUCTION

**PENMANSHIP**. Finest self-instructor lettering text 25c; 12 superbly written cards 25c; variety beautifully samples 10c. Courses offered. Portfolio free. L. H. Hausam, Emporia, Kansas.

**FOR** An extremely profitable lifetime business, operate a collection-credit agency. Free folder. Cole Associates, Syracuse, N. Y.

**BECOME** Practical scientific investigator. Modern, illustrated course. Thorough training by former agent U. S. secret service. Particulars free. International Secret Service Institute, PM-118, Hoboken, N. J.

**BLUEPRINT** Reading taught by mail. Write Blueprint Reading Institute, Dept. A, Box 5662 Metropolitan Sta., Los Angeles.

**CHESSE**. Instructive. Interesting. Particulars free. Chess Thoughts, Pearl River, N. Y.

**INVENTIVE** Minded can become independent. Explanation free! D. Higbee, Cantil, Calif.

**SONGWRITERS** Wanted. Instruction book free. Song Bureau, Dept. 44, Salem, Indiana.

**ATTAIN** Mastery! Nervousness, fear, worry! Psychological instructions. Literature gladly mailed. John A. Englund, Box 335, Ironwood, Mich.

**MEN—Women**. Get U. S. government jobs. \$105-\$175. Prepare immediately for examinations. List positions, free. Write today. Franklin Institute, Dept. C3, Rochester, N. Y.

**UNEMPLOYED?** Discouraged? For results try our job getting methods. Write. Employment Counsellors, Box 1283-K, Milwaukee, Wis.

**ASTROLOGY** Taught. Personal help. Material supplied—free-will offering. Albert Watt, 212 Cranston St., Providence, R. I.

**LEARN** Electric arc welding at home, by experienced welder. Free particulars. Roy Ankerman, Wapakoneta, Ohio.

**LEARN** Skilled trade. Practical instruction, twelve trades. Learn by doing, in trade school not operated for profit. Request bulletin M. Ranken Trade School, St. Louis, Mo.

**BALLROOM** Dancing instructions \$1. Box 66, Sta. W, Brooklyn, N. Y.

**LEARN** Alternating electricity. Material result years industrial teaching. Professional engineer criticizes problems. Write Howard Batt, Westfield, New Jersey.

**AD** Writing pays. Learn at home—Only ad writing course by actual head of successful advertising agency. 7 lessons, supplements, 56,000-word, self-teaching manuals—\$12.50 covers all. Send money—or write today. Romer Educator System, 809-B Thirteenth St., N. W., Washington, D. C.

**LEARN** Radio in your easy-chair! 1 big book teaches you everything about radio, electricity, sound, television, cathode-ray tubes, Ghilardi's popular quick-training "Radio Physics Course." \$4 complete. Free circular. Schranz, Dept. APM-118, 45 Astor Place, New York.

**"THINK** And Grow Rich"—Tell bow! \$2.25, stamps. Suchan, Alpha, Minnesota.

**WIN!** Thought control exercise builds amazing confidence, conquers bad habits, timidity, fear. 50c coin. Joel Widmer, Webster Groves, Mo.

**IF** You like to draw, sketch or paint—Write for talent test (no fee). Give age and occupation. Federal Schools, Inc., Dept. PM 128, Minneapolis, Minn.

**CUSTOMS**, Immigration, investigator civil service examinations pending. Start \$2000 yearly. Two complete exams, answers, \$1.10. Pergande, Publishers, Milwaukee, Wis.

**SECRET** Investigation. Experience unnecessary. Detective particulars free. George Wagner, M-2640 Broadway, N. Y.

**PREPARE** For big jobs. Drafting for diesel, welding and streamlining; blueprint reading. Manager, 7050-A, Kimbark, Chicago.

**MOTHERS** Use your hands mechanically. Help keep family well. Circulars sent. Murray Publishers, 463 Douglas, Elgin, Illinois.

**IF** You are unemployed or dissatisfied with your present position, earnings or pay check, and believe our investigation will disclose you as honest, moral, upright, energetic and of average intelligence, write at once, giving your age, present occupation and past experience to The Modern Scientific Extension Aid, Dept. A, Box 114, Rochester, New York.

**WATCH** Repairing is steady profitable work. Experts always in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., 2010 Manhattan Building, Chicago.

**MAKE** More money. Get a U. S. government job. Get our new plan for obtaining one—no obligations. Age 18-50. Write Ozment Instruction Service, 101, St. Louis, Mo., immediately.

**LEARN** Auto mechanics, body, repairing, welding, electricity, refrigeration. Diesel. Stevenson's, 2008A Main, Kansas City, Mo.



**MASSAGE, Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail.** Evans Correspondence School, Montgomery, Ala.

**GOV'T Jobs** start \$1260-\$2100 year. Men-women age 18-30. Former examiner's tested method helps qualify you. Particulars, list jobs free. Write today. Patterson School, 8C Mercantile Bldg., Rochester, N. Y.

**LEARN** Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Co., 601 Lake St., Chicago.

### CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

**GOOFY** Cartoon ideas—easy! Gargantuan 25c. Cartoonmart, Box 183, West Palm Beach, Fla.

**CARTOONING, Lettering, etc., 46 lessons, 600 illustrations, including practice sheets, pens, pencils. Drawings criticized. \$1.00 complete.** Allen Service, 1799 E. 100th, Cleveland, Ohio.

**STUDENTS, Professionals, modern script lettering charts. Two volumes, \$2.00. Samples, 3 cents.** Stein Studios, Flatiron Building, New York.

**DRAW** Instantly without training with the Mur-O-Graph. Make steady income drawing for advertisers. We show you how. For complete details write Mur-O-Graph Co., Box 4218-C, Dallas, Texas.

**ARTISTS!** Sell your drawings, cartoons, designs; establish paying studio. Hundreds buyers listed; \$35-\$75.00 prizes; illustrated instructive articles produce success, bigger money. Regular 25c sample 10c. Artist, 320 Doty, Madison, Wisconsin.

**CHALK Talks.** Laugh producing program, \$1.00. Catalog 10c. Balda, the Cartoonist, Oshkosh, Wisconsin.

**CARTOONING, Sketching, etc. 46 lessons, 600 illustrations, including drawing paper, pens, pencils. \$1.00 complete.** Fraba Service, Poplar Bluff, Missouri.

**PEN And ink illustrations for catalogue and general printing purposes at right prices. High grade work.** Heraldic Studios, 1914 Oakdale Avenue, Chicago.

**EARN** cash income, copying and duplicating simple cartoons for advertisers. S-M Service, Argyle, Wis.

### PLAYS, STORIES, MANUSCRIPTS

**WRITERS:** Former newspaper, magazine editor will edit, revise your manuscript. \$1. Fredericks, 944 Eighth Avenue, New York.

**SHORT** Stories and novels rewritten and typed for marketing. Weiton Tinney, Winnsboro, Texas.

**SONGWRITERS** Wanted, write for free book. Song Bureau, Dept. 42, Salem, Ind.

**SHORT** Stories revised, typewritten, marketed. Hursh, Box P-1013, Harrisburg, Penna.

**EVERYMAN'S** Legal Manual. Authoritative advice. \$1.00. Popular Mechanics, 200 E. Ontario St., Chicago.

**STORIES** Rewritten, marketed. Bulletin free. Thomas L. Powls, Libertyville, Illinois.

**WANTED.** Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 209, Toronto, Can.

**POEM** Writers, songwriters. Send for free Rhyming Dictionary, Songwriters' Guide. Submit best poems, melodies today for bonafide, superior offer. MMM Studios, Dept. 33H, Portland, Ore.

**STORIES** Rewritten, criticized, typed, marketed. Plots furnished. Holland, Box 2154, Houston, Texas.

### ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

**LEARN** Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3432, Chicago.

**ADVERTISING** Placed all magazines, newspapers, radio. Lowest rates. Free service. 64 page rate book free. Baker Advertising Agency, A-189 West Madison, Chicago. Successors to Ankrum. Established 28 years.

**24 WORDS** in 100 weeklies \$4.98. Darrell Agency, Jackson, Tenn.

**MAIL-ORDER** Ad reaching 1,500,000 families throughout United States \$15.40 inch. Newspaper, magazine, ratebook free. Chicago Union Agency, 20-P West Jackson, Chicago.

**30 WORDS** Printed 10,000 advertising circulars, distributed to mailorder buyers \$1.00. Particulars. Bob Lee Associates, Box 845, Little Rock, Arkansas.

**BARGAIN—Fifty words, 20,000 M.O. magazines 50c, Inch 75c. Three insertions price of two.** Parker Publications, Peterboro, Ont., Canada.

**INCH** Display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

**ADVERTISE: 24 Words** in 250 newspapers \$10. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

**FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates.** E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

**DIRECT-MAIL** Advertising services. Sales letters that sell. Mailing lists. Omaha List & Letter Co., Box 2172, South Omaha, Nebr.

**LEARN** To write advertising by studying recent issues of the Advertising Almanac—three dollars each with free study instruction sheets. Each issue contains several hundred advertisements. Excellent for department store advertising writers and all students of advertising. Advertising Almanac Services, Inc., 320 East 45th Street, New York City.

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### BUSINESS SERVICE

**CHICAGO** Mail address \$1 monthly. Your personal, business mail forwarded daily. Established 1919. General, 56 West Washington.

**WHERE** To buy anything! We represent wholesalers, manufacturers. Special discounts to 50%. Universal Buyers Service, Lakewood, New York.

**WASHINGTON, D. C.,** mail address; business, personal. Your mail reforwarded daily. Hawkins Mail Service, 817 Fourteenth.

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**ORIGINAL, Cushion mounted.** One, two lines 25c; three 35c; four 45c. Facsimile signature \$1.50. Stamp Works, 814 Bradley, Peoria, Illinois.

**"AVOID," "Fraud orders," "25 lesson course in mail order selling."** 49c. Richard DeLong's, Battle Creek, Mich.

**3 LINES** 30c. Cushioned; 2000 business cards \$1.50. Advance, Pewaukee, Wis.

**NAME, Address, 2 lines 25c; 3 lines 35c.** Stamp Works, Auburn, Nebr.

**CUSHION** Mounted one-two lines 25c; three 35c. 100 letterheads, 100 envelopes \$1.00. Hauer Press, 1314 Ford, Youngstown, Ohio.

**2 LINES** 25c, 3 Lines 35c. Stamp Works, Centerport, N. Y.

**ENVELOPES—1,000, 6 1/4's, \$1.75; 1,000, 10's, \$2.85; 100 sheets carbon paper, \$1.50. Prepaid. "Everything for the office."** Labahn, 603 Main, Evanston, Illinois.

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**INCREASE** Business now. "Excelsior-graph" Rotary Stencil Printer reprints thousands everything you typewrite, hand-write, draw or trace. Colors, \$19.75 to \$41. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

**10% DISCOUNT.** No down payment, 75c weekly. Nationally advertised portable typewriters, adding machines. Booklet. Rockaway Typewriter Service, 1085 White St., Far Rockaway, New York.

**RIBBONS, Carbons, rubber stamps, office supplies.** Roth Printing, Jamaica, New York.

**NEW \$3.75** Automatic adding machine. Fully guaranteed. Bassett, Box 302-K, Altadena, California.

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**HAMMERMILL** Letterheads, 300, 8 1/2 x 11, any color paper and ink, \$1.48 postpaid. Free particulars. Woodruff's, 217A Lewis, Duluth, Minn.

**1000 ENVELOPES** \$1.90, 5000, \$7.75. Postpaid. Samples. Direct Mail, 480 Canal, New York, N. Y.

**125 BOND** Letterheads with envelopes \$1.00. Harhan Press, 5239 George St., Chicago, Ill.

**1000 6 1/4 BOND** Envelopes \$1.95. Samples. Feld, Elmwood Place, Ohio.

**250 LETTERHEADS, 250 Envelopes, 100 cards, \$1.95.** Reminder, Monroe, Wisconsin.

**\$1.00 EACH** 250 Letterheads, envelopes, statements. Postpaid. Allen, Fort Edward, N. Y.

**1000 3x6 CIRCULARS** 45c prepaid, 75 words. Richard DeLong, Battle Creek, Mich.

**500 LETTERS** Multigraphed exactly as if typewritten \$1.70 (20 lines.) Multi-graphers, Ashland, Virginia.

**COMPLETE** 20 Page printing price list, 5c. Nixon, Stevens Point, Wisconsin.

**\$1.00 POSTPAID—125 8 1/2 x 11** Letterheads and 125 envelopes. Benneville, 907 West Roosevelt, Philadelphia.

**LABELS.** Quality. Value. Price list free. Keelerprint, 4237-W Cermak, Chicago.

**ASK** For free circular on how we can print your pamphlets. Haldeman-Julius Co., Pamphlet Desk P, Girard, Kansas.

**1000 3x6 CIRCULARS** \$1.00; 6x9, \$2.00; prepaid. Unique Print, Paducah, Ky.

**SPECIAL.** 500 Letterheads and 500 envelopes \$3.00, 1000 each \$4.75. Bond paper. Postpaid. Hustler, North Salem, Indiana.

**CLASP** Envelopes, 100 assorted includes 25 different sizes, advertised brand only, \$1.00 postpaid. General Envelope Company, Boston.

**1938 PRICELIST.** Portfolio of samples free. McCall Press, 1326 South 27th, Omaha, Nebr.

**LETTERHEADS, Envelopes, statements, order blanks, etc.** Free estimates. Johnson and Lee, Fort Atkinson, Wis.

**1000 6x9 CIRCULARS** \$2.50. Each additional thousand \$1.00. Edward Hutter, 666 Toga Ave., Kingston, Penna.

**125 EACH** Letterheads, envelopes \$1.00. 1000 business cards \$1.00. Tucker, Box 65, Indianapolis.

**PRINTING?** Lowest prices, samples free. Churchill, 4316 So. Salina, Syracuse, N. Y.

**PRINTING** Cuts made; finest quality; zinc (line) \$1.25, (10 square inches); halftones; electros, mats; artist; free price list. Riteway, 1466 PP Broadway, New York.

**100 CHRISTMAS** Cards, name printed, \$2.50. Hamilton, 4341 Meade, Chicago.

**1000 2 COLOR** Business cards, \$1.95. Statements, letterheads \$1.75. Simon, 1214 W. 52nd Street, Chicago.

**MAIL.** Order dealers! Circulars \$1.50 1000. Letterheads, envelopes 150, \$1.25. Sample imprints, M. Wilson, 1724 Monroe Street, Madison, Wisconsin.

**\$2.25—1000; LETTERHEADS, Envelopes, statements, circulars.** Samples. Midwest Printing, 514P Huron, Minneapolis, Minn.

**PERSONAL** Stationery bargain—Fifty sheets and 25 envelopes printed, 25 cents; or fifty cards; coin. Beasley, 694 Bay St., Stapleton, N. Y.

**200 LETTERHEADS** And envelopes, \$1.50; 500 each, \$3.00; 1000 either, \$2.95. We print anything; samples, quotations free. National Printing, Cape Girardeau, Missouri.

**LABELS—All kinds.** Estimates free. Arterair Label Company, Asheville, N. C.

**1000 BUSINESS** Cards, postpaid, \$1.00. Superba Print, 912 Towne, Los Angeles.

**1000 INVOICES, Letterheads, envelopes, \$2.85; 5000, \$9.50.** Good printing reasonable. Loneim, Paulding, Ohio.

**250 8 1/2 x 11 LETTERHEADS** \$1.00. 250 6 1/4 Envelopes \$1.00. Prepaid. Victors Print, Exeter, N. H.

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100 BOOKS Personal matches printed your name, address. Only \$1.00 prepaid! Order direct from this advertisement. Sanderson Match Co., Ottawa, Illinois.

1000 6x9 CIRCULARS, Letterheads, envelopes, postcards, \$2.95; 5000, \$9.45. All printing reasonable. Samples. Goodprint, Harrisonburg, Va.

500 STICKERS, Four lines, 25c. Fine labels. Cott's, Spickard, Mo.

500 3x2 1/4 FOUR Line gummed stickers, 25c. Moritz Printery, Saginaw, Mich.

5,000—5x9 CIRCULARS \$9.00. Hamilton Press, 4341 No. Meade, Chicago.

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PRINT Your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit \$9.00; job presses \$11 up. Details free. Kelsey Presses, E-11, Meriden, Conn.

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SMALL Printers: Get free list shop kinks. Ogg's, Tampa, Florida.

SPECIAL—One font 14 point Bodoni shaded card type (new) and list of type bargains 50c. Econofoundry, 7137 Constance, Chicago.

PRESSES, \$7.00 Up. Type, supplies. Lists 3c. Landis, Richland, Penna.

STOCK Cuts 40c up. Catalog 10c. Gregor's, 79-N Main Street, Belleville, N. J.

BARGAINS, Presses, type, List 3c. Exchange D-15, 22 Orient, Meriden, Conn.

BARGAINS—Presses, type, supplies. Send stamp, 159 Harvard, Cambridge, Mass.

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PATENTS—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 58-H Adams Bldg., Washington, D. C.

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WANTED—Small patented or unpatented articles to manufacture or purchase, P. O. Box 122, Oak Park, Ill.

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2 CYCLE Engine, quick, complete exhaust, no scavenger pump. Write 4417 Itaska, St. Louis, Mo.

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SELL Your patent through a small classified ad in Popular Mechanics. Many inventors have found buyers in this way. Ask me for proof—I'll gladly send it to you. F. W. Johnson, Manager Classified Advertising, 300 E. Ontario St., Chicago.

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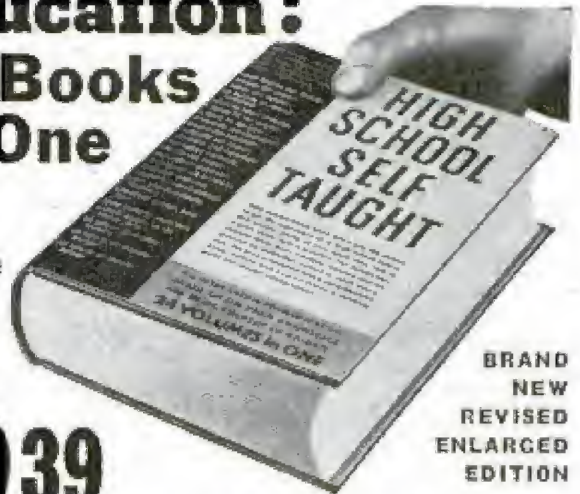
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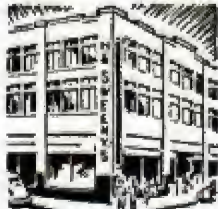
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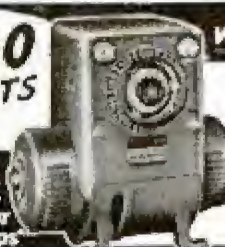
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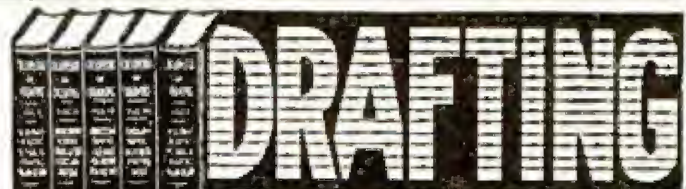
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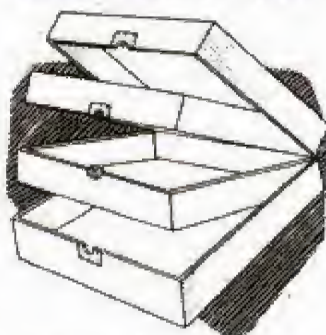


# NEW INVENTIONS

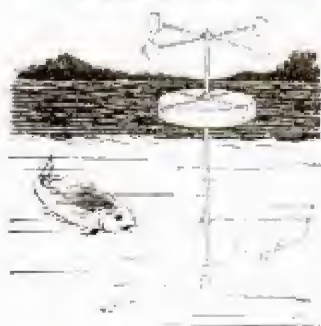
(Continued from page 20A)

**H**OUSEWIVES will find a recently patented cord holder handy when the electric iron is used. It consists of a vertical support which is hinged to permit ironing at the far end of the board. The cord is held by a small clamp near the base, then is carried up the supporting rod and through a sort of clamp at the top. The holder prevents damage to the cord and keeps it clear of the ironing board at all times.

**H**ANDY for the traveler is a trunk with compartments which may be locked separately. A patent was issued recently to protect the inventor. The trunk has a cover and three trays, arranged so that the whole or any one of the trays may be kept locked. The base of the trunk is the bottom of the third tray.

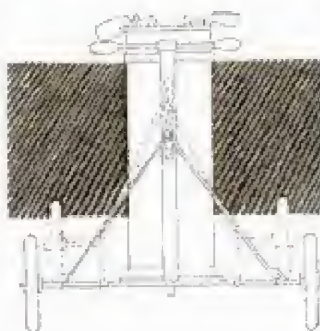


**F**ISHING equipment which does its own angling has been patented recently. It is arranged so that movement of the lure through the water is accomplished without aid from the fisherman. It consists of a stand with radial arms on which a cork plate is



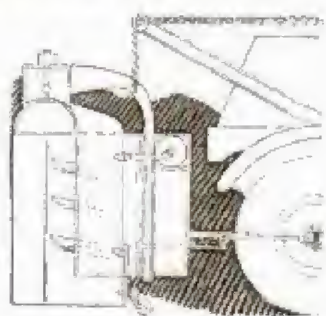
mounted for supporting the stand in the water. Below the surface extends a rod to which is attached a horizontal rod with a short line and lure. At the bottom of the vertical rod is another line and lure. Above the water is a vertical rod to which are attached horizontal rods with wind-catching cups. The wind thus turns the device, providing motion for the lures.

**F**OR the golfer there has been patented a handy club-carrying bag on wheels.

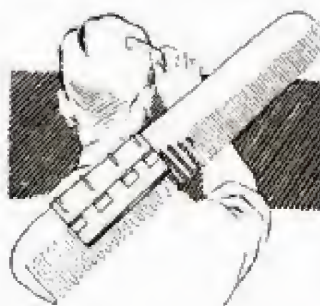


The axle has foldable end sections to raise the wheels when it is desired to place the bag end up on the ground while the golfer plays. The carrier has a handle to manipulate it on the course.

**I**N TENDED to facilitate removal of snow, a machine for attachment to truck or tractor has been patented. It is designed to melt the snow rapidly as the truck moves forward. There is a contact plate which is heated by burners to provide temperatures high enough to reduce the snow to water. Shutters in the plate allow the melted snow to pass through, disposing of the water.



**D**ESIGNED to meet the demand for some means of cutting one's own hair, a cutting tool for attachment to the comb has been patented. It clamps on the back of the comb and the cutting edge extends downward beside the comb's teeth when



a blade has been inserted in the holder provided for that purpose. The cutter does its work as the user combs his or her hair.

Due to the fact that many of the devices described in this department are still in the patent office stage and are not on the market, Popular Mechanics Magazine cannot undertake to supply further information regarding them.



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The author, G. E. Sterling, is Assistant Chief, Field Section, Engineering Dept., Federal Communications Commission. The book is bound in durable flexible Fabrikoid.

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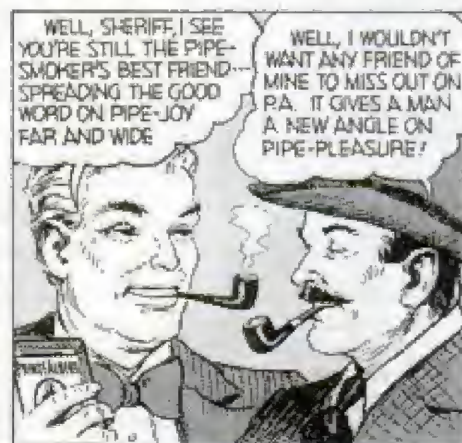
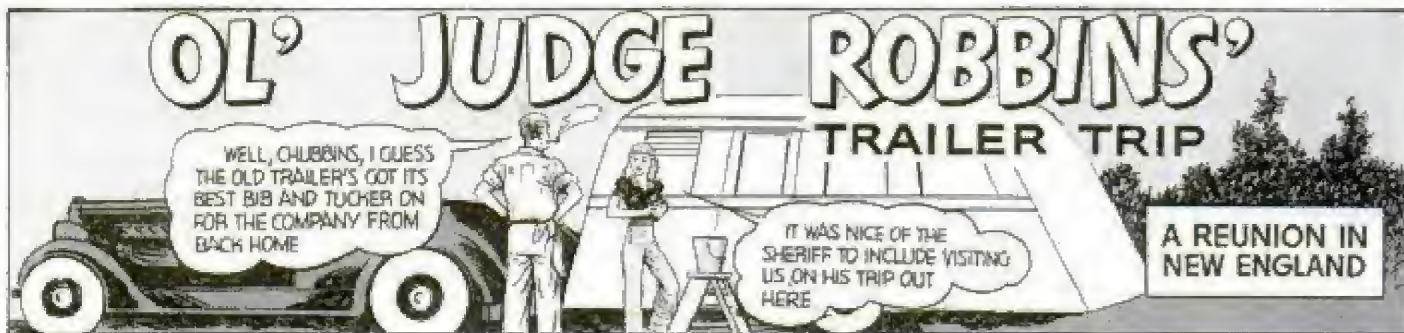
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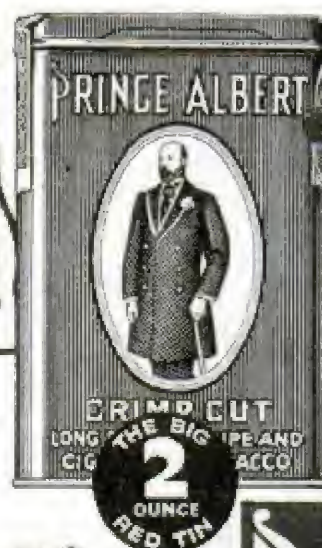
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# Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 70

NOVEMBER, 1938

No. 5

*New* OIL WELLS 14997  
*from* OLD ONES *in*



*Jelly seal being introduced in oil well preparatory to acidifying.  
Diagram shows how acid is introduced under heavier oil*

**A**CIDIFYING of oil wells, now recognized as an industry of the greatest importance, has saved oil producers \$75,000,000 during the past five years.

The use of hydrochloric acid to increase the flow of oil was suggested more than forty years ago but, because that acid ate into the casing and machinery of the well, it was impracticable. Tests show that raw hydrochloric acid corrodes and pits metal at the rate of ten pounds per square yard per day of exposure. Recent developments have overcome this difficulty, and today acid plus an inhibitor, which keeps the acid from reacting on metal without retarding its action on earth formations, is now in use.

To the uninitiated, the restoration of partly depleted

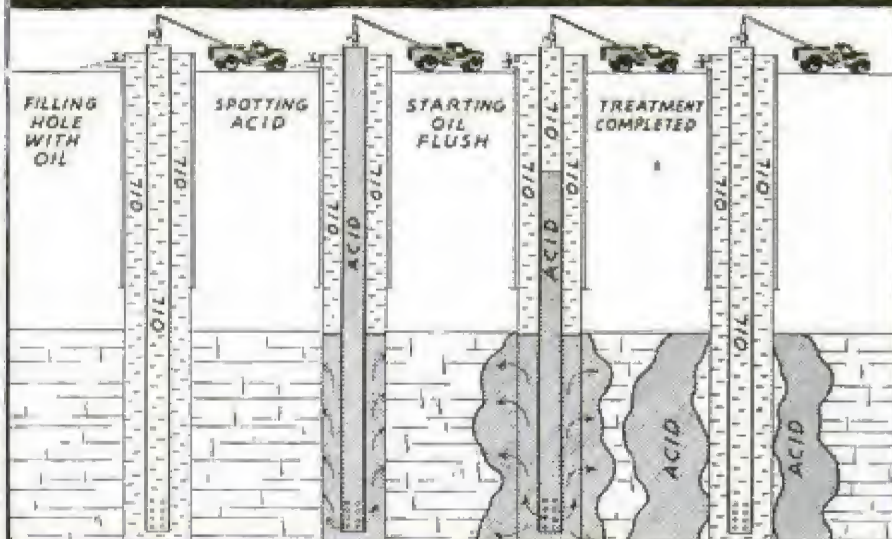
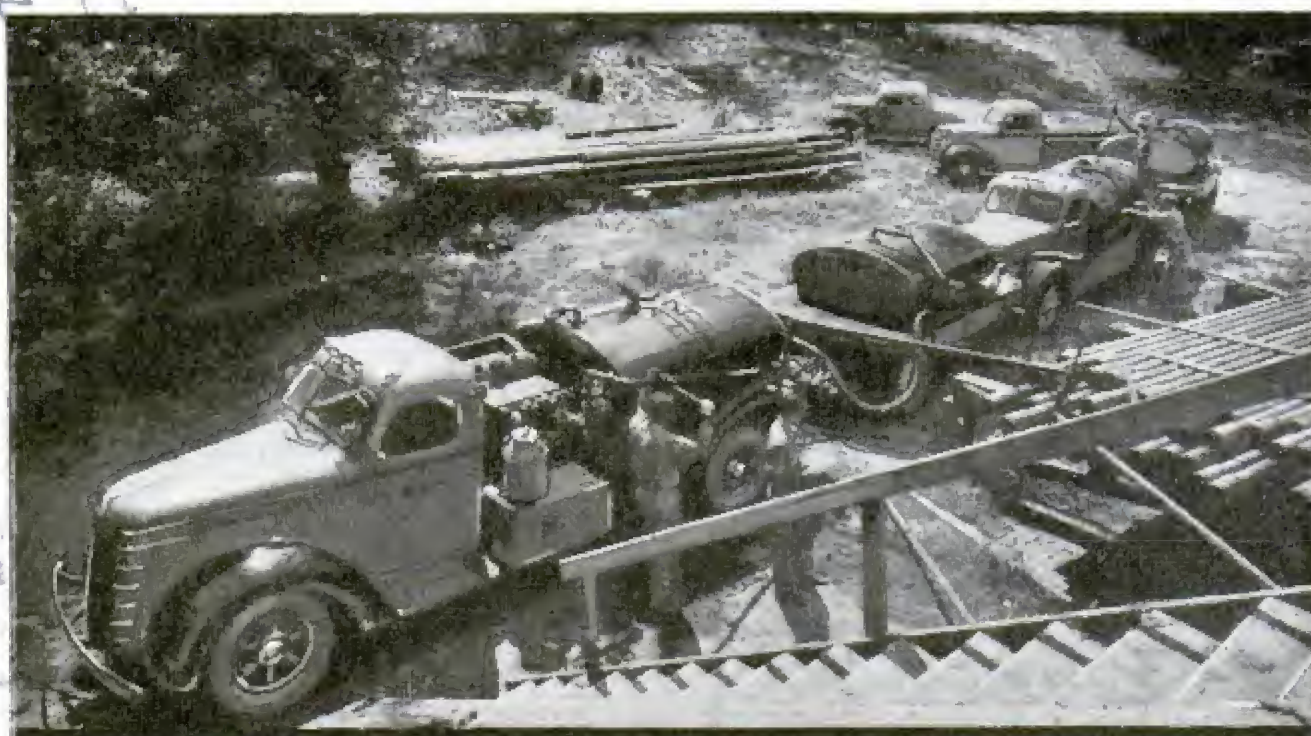


Cont. Miss Anne Pleyer Mann,  
702 Jackson St. Amarillo Texas

To the uninitiated, the restoration of partly depleted

U.S. Patent Howell, clued Kennedy





*Acidifying a well near Shreveport, La. Diagram shows four steps in acid treatment. Bottom, high pressure is necessary to force acid into millions of minute pores*



wells may seem miraculous but actually it is only a natural process following through from chemical research. It is natural, too, that acidifying decreases or increases the gas pressure which brings the oil to the surface of the ground; decreases or increases the gas and oil ratio; increases the oil and water ratio, and conserves reservoir energy.

Oil is produced primarily from sand and limestone formations. It flows through rock pores into the well and comes to surface of the earth by gas pressure or by pumping. The oil often encounters deposits in the pores which lower the rate of travel. To increase the well's production, it is necessary to enlarge the pores or remove the deposits from them. This can be done in limestone formations by forcing hydrochloric acid into these pores and allowing it to eat out the deposits. Limestone reacts with this acid to produce a water-soluble salt.

To date, 25,000 gas and oil wells in different sections of the country have been acidified. In all the major fields the huge trucks equipped for acidifying wells are an accepted part of the setup. They have a capacity of 1,000 gallons each, and travel more than 1,327,000 miles per year. With these trucks are traveling "on-location" laboratories in which peculiarities of local conditions are analyzed. Each well offers an individual problem. Depth, samples



and other characteristics must be studied before treatment. As many as 15,000 experiments may be required to solve a single problem. Wells in limestone and dolomite formations are the kinds treated. Some wells are



*Pumping 120 gallons of inhibited acid per minute into well. Left, treating an Oklahoma well with 10,000 gallons of acid*

quire as much as 10,000 gallons of acid.

Astonishing results have been obtained in increasing production in both oil and gas wells. A typical example is a gas well in Louisiana, which was brought from 1,512,000 cubic feet per day to 7,020,000—an increase of more than 400 per cent—by acidifying. Increases of from twelve to eighty million cubic feet are not unusual. An oil well in the Panhandle increased in daily production from seven barrels to 106 barrels, another went from ten to 350 barrels after treatment.

Many low-producing areas which formerly would have been classed as virtually depleted have been made profitable by acidifying. In some cases the life of an oil area has been shortened by acidifying, thereby decreasing production costs per barrel. This means that by increasing production the oil is taken rapidly from the area whereas, without acidifying, a great many years might be needed to produce the same amount of oil. On the other hand, acidifying may prolong the life of a field and greatly increase ultimate recovery by

conserving gas pressure. By a technical process in the application of acid, it is possible to increase the producing ability of the oil zone, without increasing that of the gas zone. This insures longer life to the supply of gas—the most important factor in bringing oil into a well.

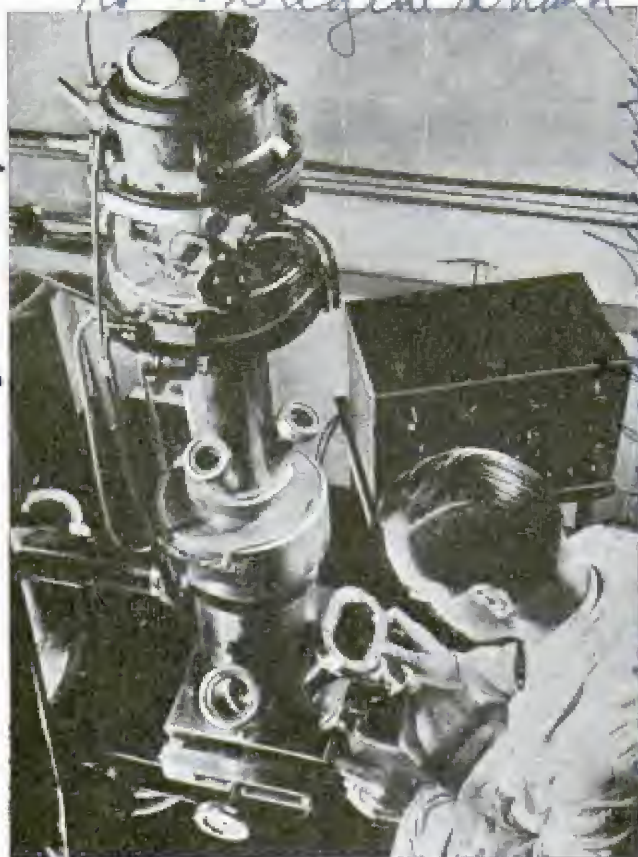
In wells where gas pressure is insufficient, expensive pumps must be installed to lift the oil. But this installation at least can be delayed by acidifying. When the pores of the formation are enlarged, less gas is consumed in bringing the oil into the well than when the formation was tight, and this gas, instead of having been spent, is saved and made available for forcing the oil to the top.

Until recent years the only artificial method of "bringing in" new wells was by the nitroglycerin method. Instead of opening the formation and letting the oil flow freely, the concussion from the explosion sometimes closes the formation permanently. In any event, there is much debris from the shattered rock to be brought out

(Continued to page 149A)



# Super-Microscope Magnifies Thirty Thousand Times

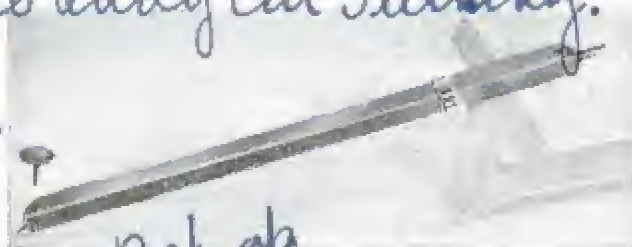


Electron rays are harnessed by this super-microscope, which can magnify an object 30,000 times

Two German scientists have invented a super-microscope that is capable of enlarging its object 30,000 times! No ordinary combination of lenses, this microscope owes its high magnifying power to the harnessing of electron rays with a 100,000-volt circuit.

## Freehand Tool for Lathe Work Has Demountable Cutters

Three sockets in a lathe tool just made available to the shop worker make possible the use of a whole battery of differently shaped cutters in the same tool. One of the sockets is diagonal, for inside work. The



Cutting heads of various shapes can be fitted in the ends of this pencil-slim holder for lathe work

cutters have been tested on the hardest of woods, and being of "high-speed" steel they can be used for freehand turning of plastics and even of soft metals.

## Wrist-Watch Recorder for Golf Keeps Hole Score and Total

Really an adding machine in a watch case, a wrist recorder for golfers not only keeps the score for each of eighteen holes but adds up the total strokes to date during the play. The hole score is punched into the recorder by pressing a button once for each stroke. One hand shows the hole being played, and others give the total score.



## "Talking Letters" on Wax Disk Dictated at Post-Office Booth



Listening to a "wax letter" dictated by the sender in a booth at the Berlin post office

You can talk to the folks back home by mail from the Berlin post office. Instead of writing a letter, you step into a special booth in the post office and dictate to a phonograph. The wax record of your "talking letter" is then mailed in a regular envelope with three phonograph needles.

Mr. Bodo von Borries and Dr. Ernst Ruska

\$3.00 for Minneapolis version \$3.40

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H980  
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21 W 1911  
New York  
Bernard Kofy Recorder

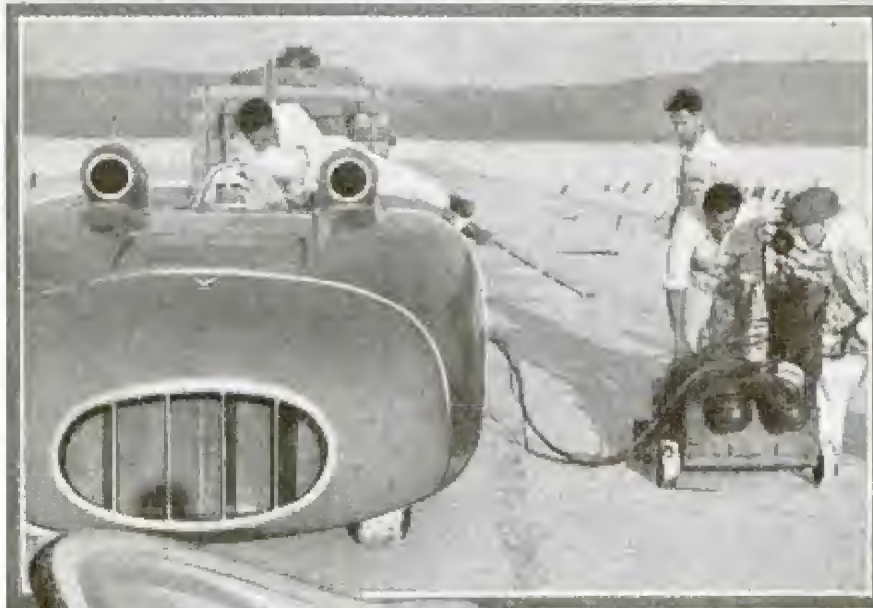


H 1021

Comr. G. G. Holmes, Jr.  
 c/o The Salt Lake Tribune  
 Salt Lake City Utah.

# HOW FAST *on* WHEELS?

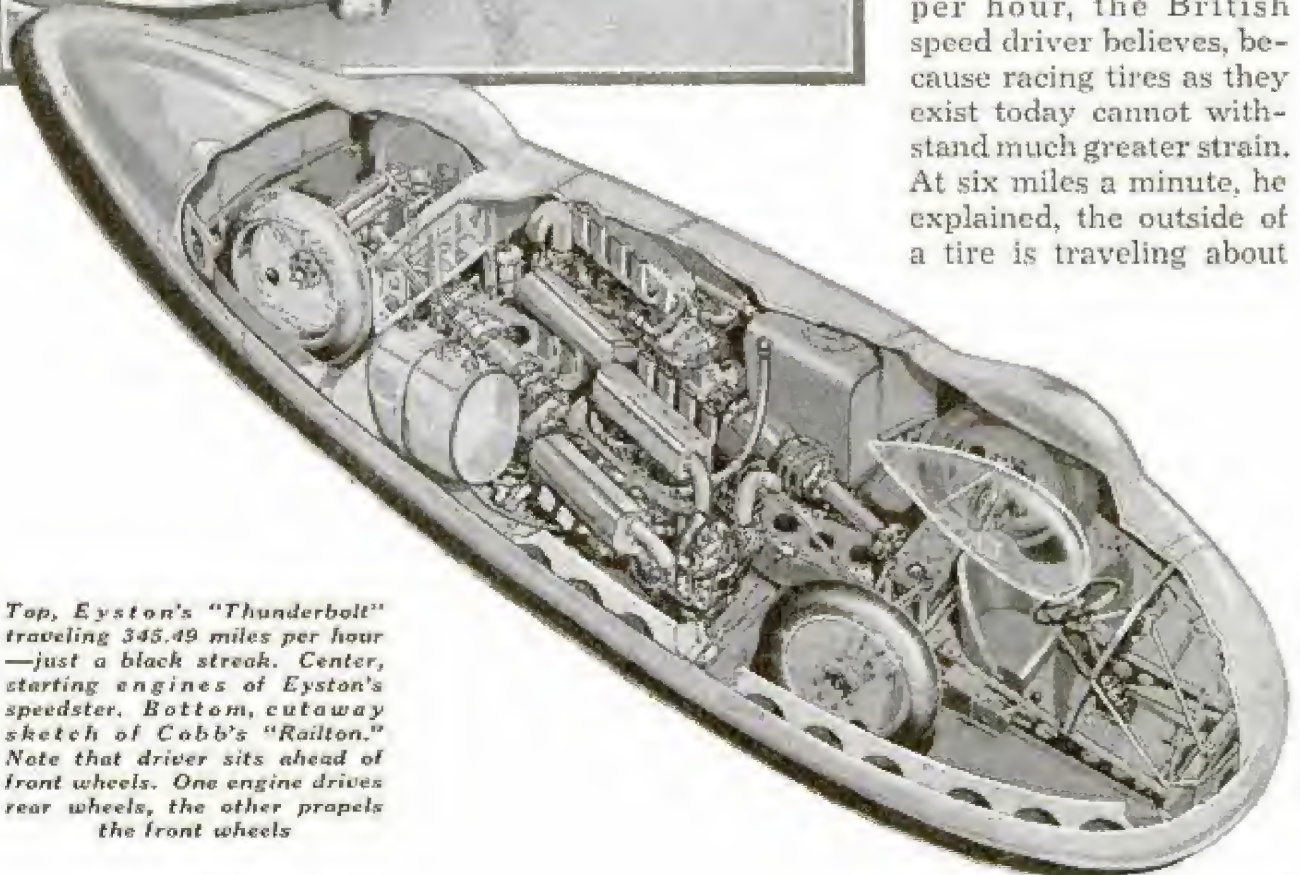
Bonnieville  
 Salt Flats



**A**FTER Capt. George E. T. Eyston had driven his "Thunderbolt" over Utah's Salt Flats at 345.49 miles an hour to set a new speed record a few weeks ago, he expressed the opinion that man probably will never travel much faster than six miles a minute on land.

Speed on wheels is limited to about 360 miles per hour, the British speed driver believes, because racing tires as they exist today cannot withstand much greater strain. At six miles a minute, he explained, the outside of a tire is traveling about

Top, Eyston's "Thunderbolt" traveling 345.49 miles per hour—just a black streak. Center, starting engines of Eyston's speedster. Bottom, cutaway sketch of Cobb's "Railton." Note that driver sits ahead of front wheels. One engine drives rear wheels, the other propels the front wheels





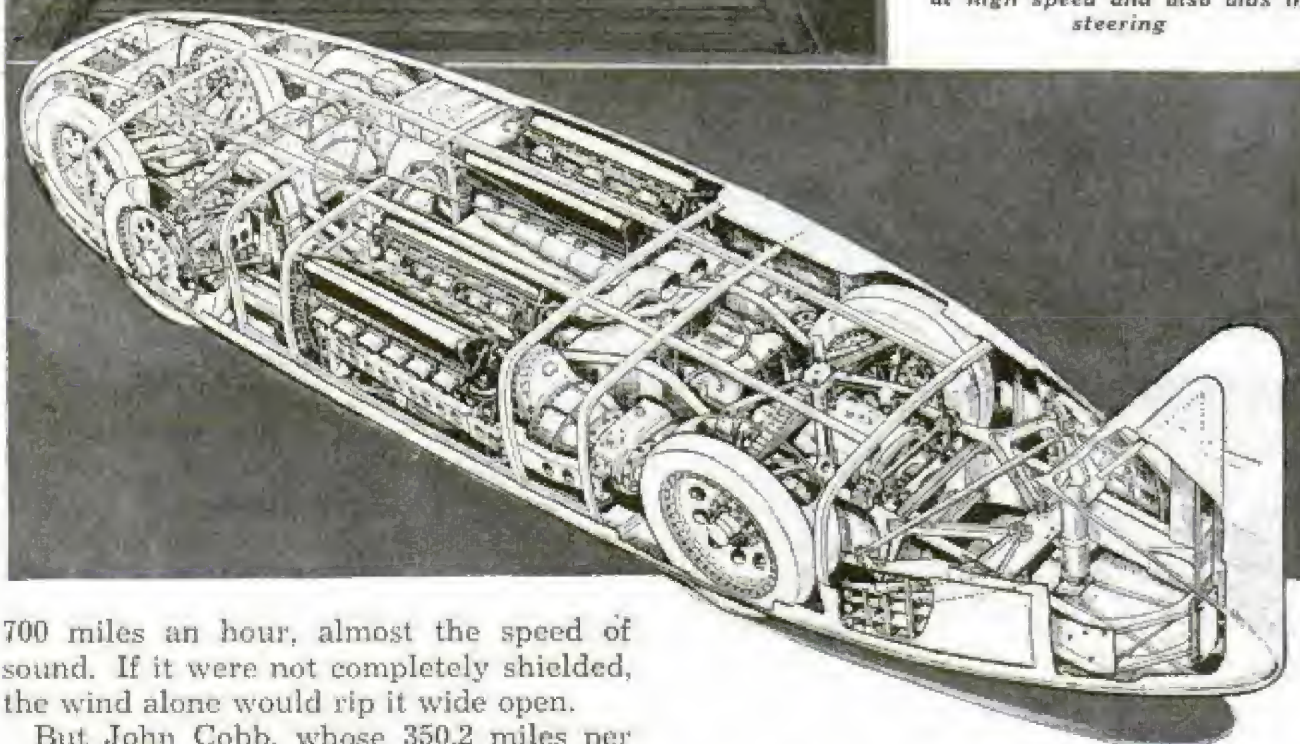


engineering continues to progress and if long enough straightaways can be found to reach top speeds and stop safely.

The British rivals are trying to solve the problem of super-speed from different angles. Eyston's formula was tremendous

(Continued to page 154A)

*Top, Eyston in cockpit of his mighty speed machine wearing gas mask as protection against fumes. Center, drawing of "Thunderbolt" shows its "crab" front wheels and its dual rear wheels. Driver sits just ahead of the engines, one of which is located on each side. The fin helps to stabilize the machine at high speed and also aids in steering*



700 miles an hour, almost the speed of sound. If it were not completely shielded, the wind alone would rip it wide open.

But John Cobb, whose 350.2 miles per hour mark in the "Railton" was upset later by Eyston traveling at 357.5 miles an hour, held that higher speeds than any yet attained were likely. In fact, he could see no limit, although he agreed with Eyston that better tires are necessary. Given such tires, he said, man can go faster if mechanical

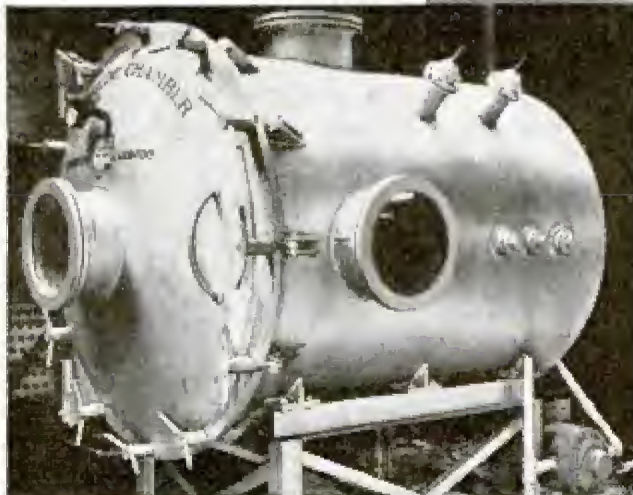
*Bottom, side view of Eyston's huge speedster just before starting world's record run over the Salt Flats course*





# Sampling the Stratosphere in a Pressure Tank

They fly to the stratosphere with the greatest of ease in a tank that never leaves the ground at the Chicago airport. United Air Lines engineers have installed the one and one-half ton steel chamber as an experimental laboratory to test the conditions that will be met by the high-flying transports of the future in the stratosphere. It can duplicate atmospheric conditions at altitudes as high as 65,000 feet. Not only will the performance of oxygen equipment, radio and other mechanical



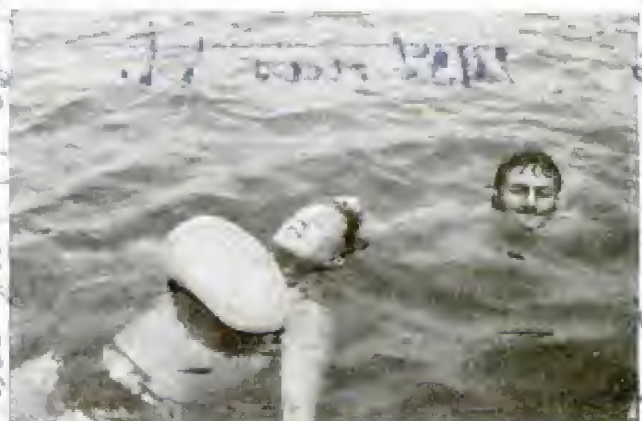
Through a window in pressure chamber, engineers are seen having a taste of high-altitude conditions

apparatus be tested in the low-pressure chamber, but it will demonstrate the effects of altitude flying upon the crew and passengers, and possible influence on the flavor and composition of food. The steel cylinder has an inside diameter of four feet and length of five feet. Large circular pressure-proof glass portholes at the top, sides and ends permit observers outside to watch instruments and crew within. To reduce pressure to the equivalent of a twelve-miles-high level, air is evacuated by mixing it with water and then discharging the water.

## Lifesaver's Belt Is Inflated Chemically When Squeezed

Life guards at bathing beaches are being equipped with a chemical lifesaving belt. Swimming out for a rescue, the lifesaver fastens the belt around the chest of the victim, squeezes it and the belt is inflated chemically. The buoyance provides support while the guard tows his charge ashore.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.



Life guard tows ashore a victim supported by belt which has been inflated chemically

Mrs. Clarence, Milwaukee  
 12930 Village Lane, Pointe du Lac, Wis.  
 Dec 1927



## Polaroid Portholes 'Light-Condition' Rail Car

Not yet two and one-half years old, the crack Diesel-electric streamliner "City of Los Angeles" of the Union Pacific railroad has already been "remodeled," and the major innovation in the remodeling was the addition of a light-conditioned observation car. Polaroid windows like broad portholes filter out reflected light



*The "Copper King" observation car and a closeup of its Polaroid windows, which darken at turn of knob*



and let the passenger screen out the light from the full blaze of noonday sunlight to blackness. There are no shades nor shutters. The outside window is heavy safety plate glass. Inside it are two round disks of Polaroid; the outer one, fixed, shutting off the light rays reflected from horizontal surfaces, reducing glare, and so giving the passenger an even clearer view and truer colors of the passing scene; the inner disk

revolving at the turn of a knob, adjusting the light to the individual's sensitivity. A quarter turn brings the disk to its darkest position, where it appears deep purple or black. There are twenty-nine of these windows, twenty-seven inches in diameter. They are the largest products thus far made of this magic cellulose glass whose polarized crystals, thousands of billions in each square inch, all lie parallel and so give parallel direction to all the light waves they let pass. The lounge-observation car in which these first variable density windows are installed is named the "Copper King" for its interior decorations of sparkling copper.

## Thimble-Size Electric Motors Drive Miniature Airplane

Electric motors only half the size of a postage stamp were built by Rudolph W. Chaney of Hackensack, N. J., for a com-



*Electric motors made for a miniature airplane, compared in size with a postage stamp*

pletely electrified miniature airplane. The model maker spent more than a year experimenting and remaking parts to obtain an engine that would run cool at high speed. The motors are open-shafted and self-starting by means of commutator and brushes, operating on one and one-half to three and one-half volts, alternating or direct current. The armature has a diameter of nine thirty-seconds of an inch. The tiny airplane will have propellers, windows and landing gear carved from silver. The body, still in process of building, is to be either platinum-plated or shaped from a highly polished plastic material. The wing spread of the ship is only six inches.



Camera  
King,  
NBC nautical  
observer

429.  
Announcer  
Alan Kent

Emile Schürmacher  
727 Park Lane  
New York



# ETHER JUMPERS NEVER SLEEP

THE SEA is going on the air in this typical ether-jumper program in which a nautical observer and an announcer for NBC have joined forces to describe the operations of the Atlantic coast fishing fleet from a steam trawler.

H. George  
Baker

Sehla



CA Peregrine  
Es 429

Portland



CONTROL supervisor, left, at the dials during a broadcast from a mine and, below, the man "who does the impossible" at his board in the main control room during a broadcast emanating from a point half way around the world.

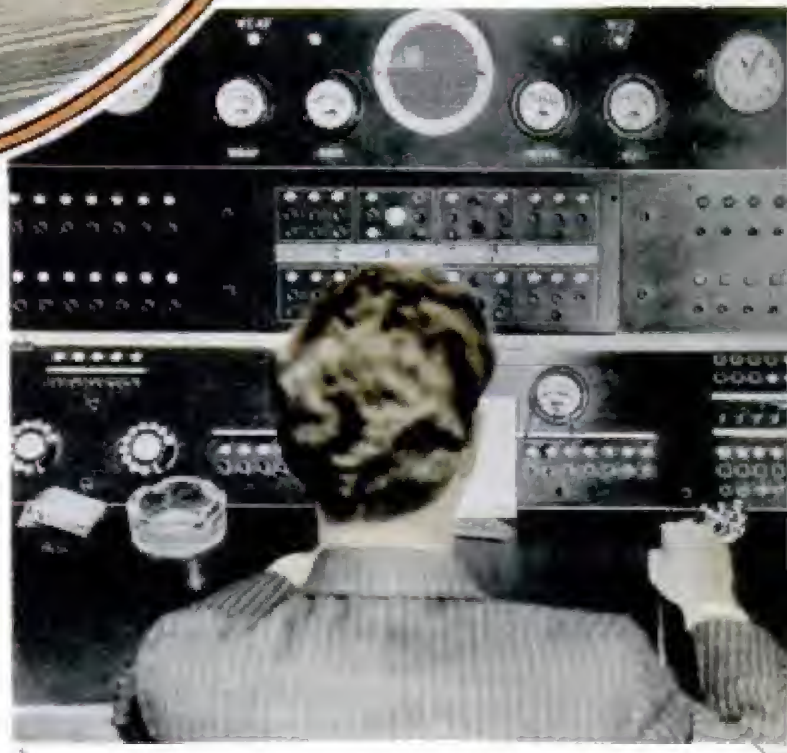
By Emile C. Schnurmacher

Mr. James C. Moxley

**T**HE man who stops time in its tracks, or turns it forward to tomorrow or backward into yesterday by simply pressing a button, sits quietly in front of the long panel in the master control room of the National Broadcasting Company at Radio City, watching the hands of a clock which point to twenty seconds less than twelve o'clock noon.

In just twenty seconds the musical program being broadcast by a Philadelphia concert orchestra will leave the air. In twenty-one seconds, hundreds of thousands of listeners who are tuned in on the network will, through their sense of hearing, be transported half way round the world to Delhi, India, where a speaker is waiting to give a description of an amazing election, telling how 33,000,000 voters, most of them illiterates, went to the polls.

But the man at the control panel does more than carry the radio listeners in imagination to Delhi. He also bridges time for them. Although it is noon in New York, the program in Delhi is tak-



ing place at 10:30 p.m. Berlin is listening to it at 6 p.m., Rio de Janeiro at 2 p.m., Shanghai at 1 a.m. tomorrow morning, Tokio at 2 a.m. and far-off Wellington, New Zealand, at 4:30 a.m.

The ether jumpers never sleep as their programs go around the globe. The rapid strides of radio during the past few years have made possible world-girdling hook-ups which, in the space of an hour, will take you into yesterday, today and tomorrow, from a celebration in Moscow to a Gaucho or-

maybe New



ls 427

Portland

RADIO crew ready to descend a mine shaft for a broadcast and, below, control supervisor at top of shaft during the broadcast from the mine.

Left to right -  
C.C. Moore, N.B.C.  
M.H. Salshury  
Mine Sup't  
A.H. Clark  
N.B.C.

658



Peregrine



chestra on the Argentine pampas, from a ceremonial fete in Tokio to a native dance in Suva.

Ether-jumping programs with their intricate hook-ups, engineered with split-second accuracy, have become so popular that John F. Royal, vice president of the National Broadcasting Company, points out that international broadcasts are vying with the most popular commercial programs.

"During the past thirteen years we have presented more than 2,000 of these broadcasts and these figures tell the story of radio's achievement in international broadcasting, also symbolizing the progress made in radio engineering and science," states Mr. Royal. "Consider the first ether-





58  
**BROADCASTING** an eye-witness description of a flood. Such a program usually starts out over the short waves, and then is put on the networks.

jumping broadcast back in 1924. The pickup point was Havana, but radio used a cumbersome technique. The program of music was carried to the mainland by submarine cable and then relayed to seven stations. This required weeks of preparation.

"With the development of short waves which could be re-broadcast, the 'cigar box' control panel for broadcasting from any point whether it be a man-hole or a congressman's hat, and with other ingenious inventions and improvements by radio scientists, ether jumpers may now bring to radio audiences an address from Shanghai, a Papal ceremony from the Vatican, a concert from Berlin, the noises of a volcano in Italy and other interesting or important events in an uninterrupted

program which goes smoothly on the network although those events originate at points thousands of miles apart. It is almost as easy to switch in Paris or London today as it is to pick up a dramatic sketch from Chicago or California, or a dance band from Boston."

The development of the short wave and of the technique for re-broadcasting it on regular wave lengths proved one of the greatest assets to the ether jumpers. In 1918 a twenty-meter wave was looked upon as almost useless, but today, after many experiments and improvements in the vacuum tube, tremendous distances can be spanned with the super-power of that short wave. Even the most important sponsored network programs are interrupted by the ether jumpers when there is an event of world-



Bill  
Platen  
max garden

Es 4 29

ETHER jumpers pay no attention to time when events of international importance are in progress because, somewhere along the air waves, there are sure to be plenty of listeners. The pictures on this page show the NBC staff in action at the Olympic games in Germany.



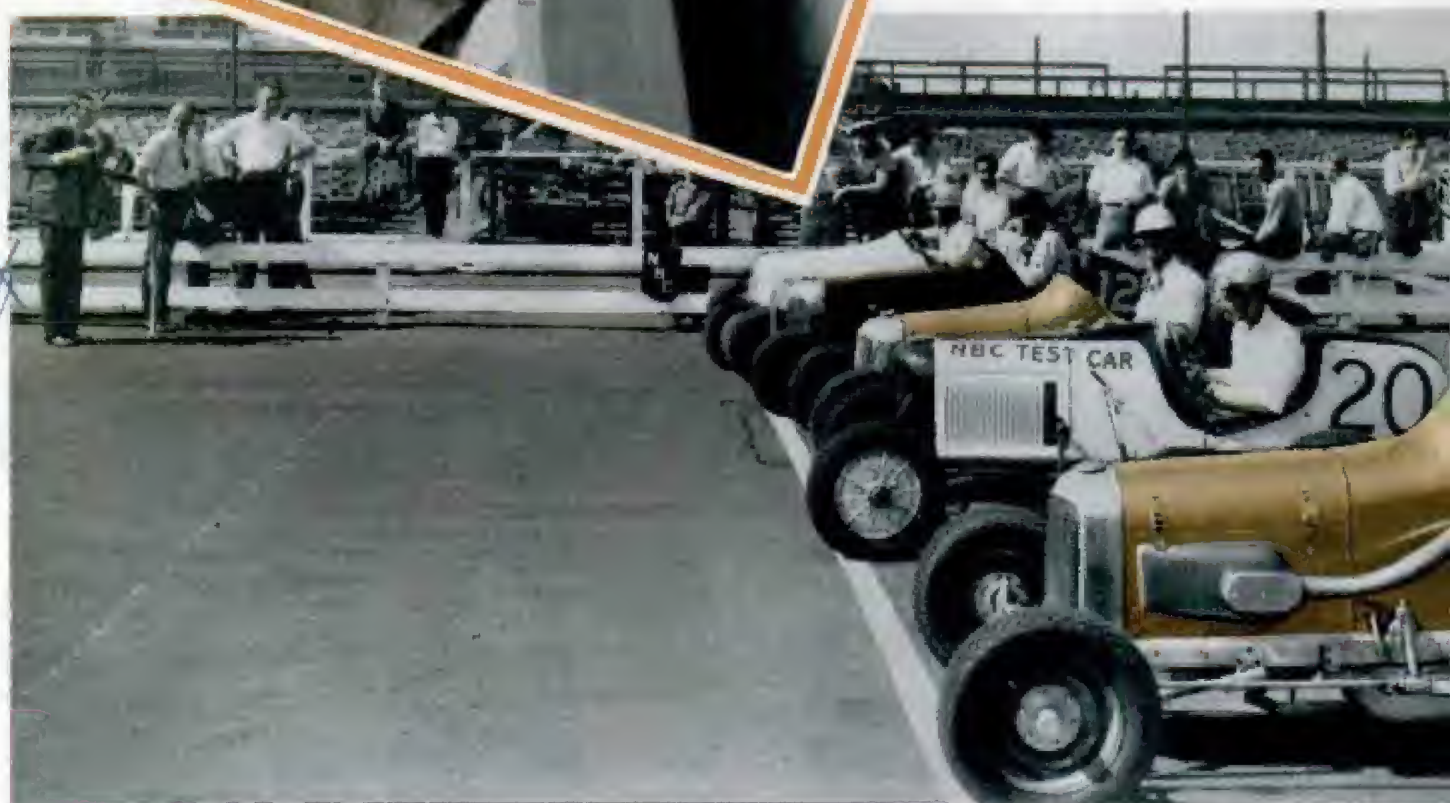
wide interest taking place. The announcement, "We interrupt this program to bring you a special bulletin from London, Moscow, Manila, Rome" or wherever the event may be taking place, has become an integral part of radio broadcasting, although the scientific preparation behind such short announcements may require weeks, or even months of work to make them possible as they occur.

An outstanding example of this occurred when King George V became seriously ill. Here was an event of world-wide importance to be flashed around the globe. Immediately watchers of the NBC took up their twenty-four hour vigil. At the gate of the palace, in front of the homes of attending physicians, in every strategic point where the official word





AN ETHER jumper broadcasting from a manhole and, below, announcing the start of a race as the cars toe the line.



of the king's passing might be given, they waited. Across the way from the palace gate, a man was stationed at a telephone connected with the British broadcasting station in London which in turn was connected with the master control room at Radio City, with a short wave "cue line" over which the engineers on both sides of the Atlantic could talk and get everything in readiness.

When the king breathed his last, the

watcher at the gate signaled the man at the telephone. "King George V died three minutes ago," the man at the phone told the control room in London. Immediately the British Broadcasting Company talked to Radio City over the short-wave cue line. The message came in over short waves to the receiving station at Bound Brook, N. J. From there it ran over telephone lines to the master control room at Radio City, where the





ANNOUNCING the death of King George V of England and, below, the maze of wires behind the "hot switch" which unite the world through long and short waves.

master control engineer pressed the "hot switch" and re-broadcast the message on the network.

Although the ether jumpers scooped the world on the news of this event they were still not satisfied, for the commercial program which they had interrupted to do so was broadcasting a cheery song. They decided that in the future when such solemn events took place even more preparation was necessary. Soon the occasion arose for such preparation, for over in Rome, the Pope became seriously ill.

Immediately the same elaborate preparations were made. But in addition to the arrangements for the ether-jumping broadcast from abroad, in Radio City another group of watchers took up their vigil. There were four organists, one announcer and one engineer on hand so there might be a short solemn program of organ music as a prelude to the announcement. In order, therefore, to scoop the world, even greater speed would be necessary than before. The ether jumpers, who measure time in split seconds, would have to beat by nearly forty seconds their previous speed in reporting King George's death so that there could be a thirty-second prelude of organ music before the announcement.

For more than a month, until the Pope finally was







656 MAIN control board of a great broadcasting system. Here the ether jumpers are tuned in with events happening all over the world.

pronounced out of danger, the studio vigil was kept, in addition to the one in Vatican City. The organists were divided into two-hour shifts and were on continuous duty, waiting for an event which did not occur.

"This demonstrates the great detailed attention which is being paid to every phase of ether jumping today," states Mr. Royal. "It is not only a game requiring the immediate adoption of every practical improvement or scientific radio device as it is originated, but requires

also great patience and the willingness to take long chances to bring world events to the radio audience as they occur.

*London Island*  
 "An impressive example of this was the expedition made to a tiny spot in the South Seas. Four tons of NBC broadcasting equipment with a staff of engineers and announcers made a 7,000-mile journey to the Southern Pacific so that ether jumpers might hear an eye-witness description of the longest total eclipse of the sun (Continued to page 128A)





# Miles of Neon Light Ten-Story Broadway Sign

Up above Broadway rises a new electric sign. Every new sign, etching its advertising message in white letters and colored lights against the night sky, adds thousands of bulbs, miles of neon tubing to the already colossal total making Broadway the "great white way." The latest is a skyscraper in itself, a steel structure 100 feet high and more than a block long, requiring a crew of twenty-five steel workers and electricians in assembling it. The



*Wide World Photos*

Back of the blaze of white and colored and animated lights that brighten Broadway are intricate electrical "brains." In circle, electricians work from chart to install wiring, switches and moving ribbons that animate a giant sign; above, raising neon tubing against a steel frame

mechanism that makes the pictures and letters flash and grow and blink is highly complicated. The builders work from diagrams showing banks of switches, rheostats, photoelectric cells and traveling ribbons that make and break contacts like the perforated paper ribbons on a player piano. In the twenty-seven blocks be-

tween Times Square and Columbus Circle in New York City, Broadway is lit by 111,000 incandescent lamps and twenty-two miles of neon tubing. When all the signs in the district are flashing and spinning at the same time they consume 3,250,000 watts an hour, sufficient electric energy to light a city the size of Denver.



12906

William Albee  
 c/o H. Seardley,  
 210 W. Harrison, Whiston, N.Y.

# Don't Pity the Poor Eskimo

By Ruth and Bill Albee



ENTRANCE TO  
 IGLOO

QOMIAK OR  
 SKIN BOAT

QOMIAK OR  
 SKIN BOAT

WHALE  
 BONE  
 SUPPORTS

PLAT-  
 FORM

HEWN DRIFTWOOD  
 PLANKS

SOD

ENTRANCE TUNNEL & STOREROOM

LADDER



Top, sketches of the skin boat of the Eskimo and of the entrance to the igloo. On opposite page is the igloo, with its air-conditioning arrangement. Bottom, this page, vestibule to entrance tunnel of igloo. Note sod and driftwood construction. The little girl wears parka, with fur garments beneath

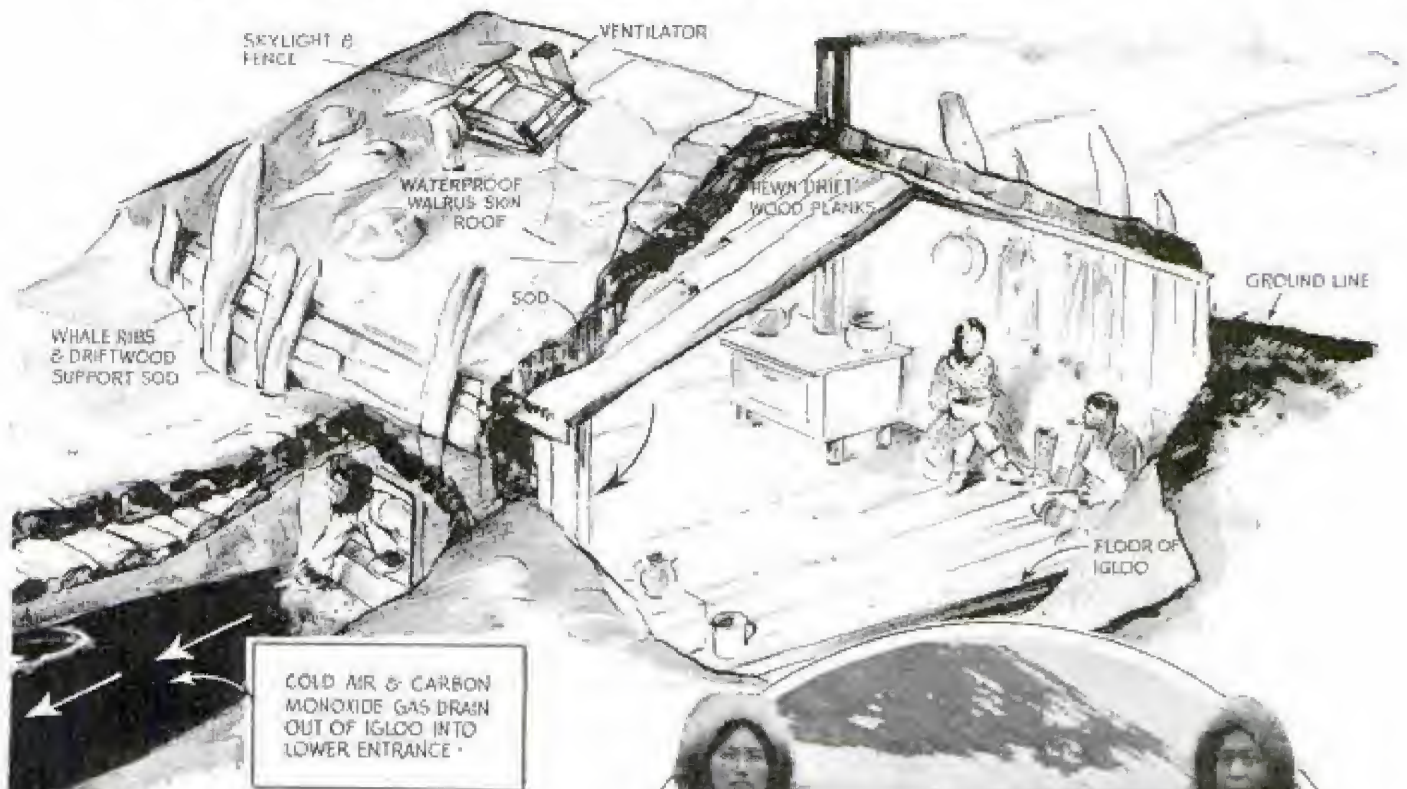
## PART I

**D**ON'T pity the poor Eskimo—at least not the Alaskan Eskimo of Bering Strait.

He lives in a land of ice, snow, howling winds and sub-zero temperatures. But he thrives on it—and likes it. He lives a stone-age existence in many respects, but he has an air-conditioned house. Most Eskimos have never seen an automobile, yet many of them fly to work in airplanes. Most of them never heard of vitamins, but they probably get more vitamins in their daily diet than any people on the globe. The Eskimo has little in the way of natural resources, but he is smart enough to make the most of what he has.



# POOR ESKIMO - - -



Aside from sod dug from the tundra swamps, driftwood picked up on the beach, and a few articles secured from traders, the Eskimo has no raw materials except those he secures by hunting. Yet from these materials he fabricates dwellings, clothing, boats and weapons. He makes them in the same pattern that his ancestors have used through the centuries because they are



*Circle, examples of what the Eskimo, young and old, wears. Bottom, typical igloo, half above and half below ground level*





*Top, good day's catch of walrus for an Eskimo crew at Cape Prince of Wales. Right, walrus head*



*Left, Eskimo child dressed in parka. Below, skylight with translucent covering and fence around it. Bottom, diagram showing various parts of the Eskimo's harpoon*



better suited to his needs and to the rigorous climate than any that civilized man has been able to devise.

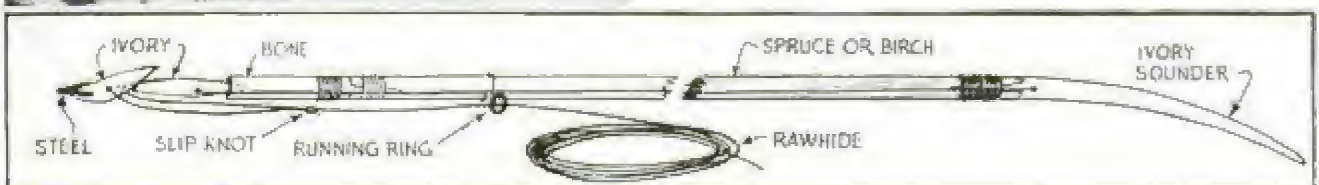
Nevertheless, he is quick to adopt the latest products of civilization if and when they have proved their superiority to his own devices and methods. Thus, we found him hunting in the same kind of oomiak or skin boat that his forefathers used—but propelled by an outboard motor. In the boat along with stone-age harpoons, we saw rifles, binoculars, a compass, and a primus stove. These modern implements make him a more efficient hunter. And he must be an efficient hunter to survive.

The Kingekmiu tribe, among whom we lived for some time, dwell at Cape Prince of Wales, Alaska, westernmost point of the North American mainland, just fifty-six miles

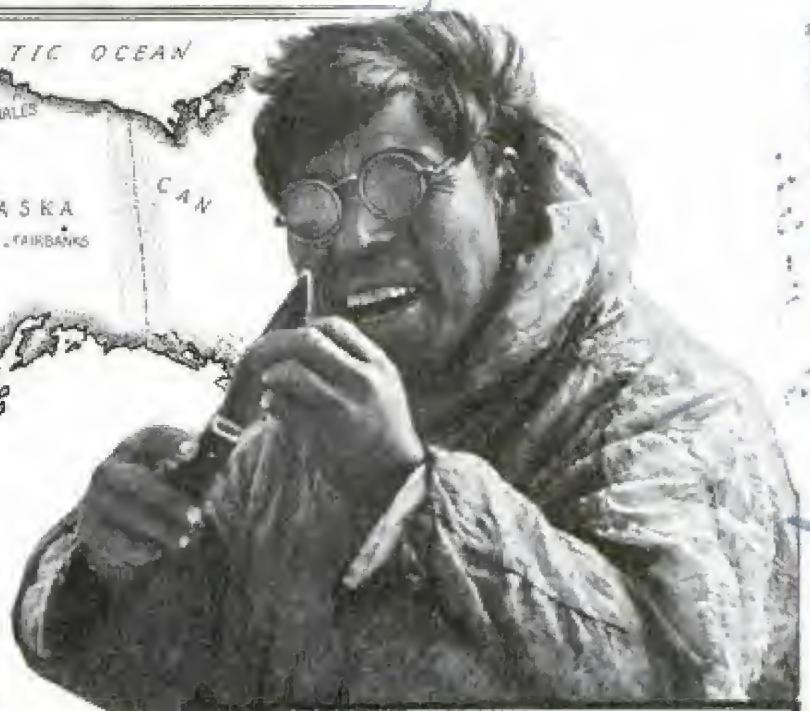
across Bering Strait from Siberia. Contrary to general belief, these Eskimos do not live in ice igloos. Virtually the only Eskimos who do are those who live where there is no driftwood.

The typical Cape Prince of Wales igloo is built half above ground level and half below and banked with dirt to minimize wind resistance. Its walls and roof of driftwood and whale ribs are covered with peat sod for insulation. Old walrus hides shed water from the roof. But if water seeps through, the sod underneath absorbs it like a blotter.

The igloo consists of one low-ceilinged room about twelve feet square and an entrance tunnel from sixteen to twenty feet long and half as wide. Light is admitted







through a skylight of translucent strips of walrus intestine sewed together with sinew. The tunnel provides storage space for food and household effects. It is also a part of the air-conditioning system. The tunnel floor is lower than that of the living room and acts as a sump allowing the cold air and the carbon-monoxide gas to drain from the living quarters. The warm air inside rises and forces the cold air down and out. A small ventilating tube in the ceiling can be opened to admit fresh air. Thus the fresh air enters at the point where the inside air is warmest, and is tempered before it descends to the floor level where the occupants work and sleep.

Like the igloo, the Eskimo parka is an air-conditioning device. Its primary function is to protect the wearer against one of



Top, left, map of Eskimo land. Right, Eskimo hunter using knife to prepare his lunch of walrus hide and blubber. Center, gathering gear for a hunt. Bottom, success on the hunt

*Bering Strait*



906  
 1000  
 walrus skin boat  
 repaired at Cape Prince  
 of Wales.



Top, oomiak equipped with outboard motor and loaded for walrus hunt. Circle, bleached skeleton of a oomiak on the beach. It is made of spruce driftwood, the parts lashed together with strips of walrus rawhide

the most dreaded of Arctic disasters—frost-bitten lungs. Essentially, the parka is a hooded shirt worn outside the trousers and fitting loosely around the chest and neck. It is usually made of reindeer or squirrel fur. The hood has a ruff of long fur to shield the face and eyes from driven snow. This ruff is usually of wolverine fur which does not "freeze up." That is, frost and ice collecting on the



Right, oomiaks turned upside down to dry on racks made of whale ribs and driftwood. Bottom, sheathing oomiak with walrus hide

hairs do not stick, but can be brushed off easily.

Cold air enters the parka around the loose bottom of the garment, is warmed by contact with the body, rises past the loose-fitting neck, and passes out through the long-haired ruff in front of the wearer's mouth and nose. There, the cold air being drawn into the lungs is mixed with the heated or "conditioned" air, escaping through the parka top.

Here in "the States" we have recently adopted the hooded, transparent rain cape that can be folded into a small envelope

(Continued to page 137A)



# New "Mauretania" Replaces Old Sea Queen



Here is the new "Mauretania," launched recently from English shipyard and to be completed in time for transatlantic service in 1939. Bearer of a proud name, this Cunard-White Star liner will have ten decks

Bearing the famous name of the former speed queen of the Atlantic, the "Mauretania," a new liner, will enter the transatlantic service in 1939. The new "Mauretania" was launched recently, largest ship ever built in England—although far smaller than Scottish-built "Queen Mary."

There will be accommodations for 1,250 passengers in the vessel, which is 772 feet long—just ten feet longer than the previous "Mauretania," now retired, which several times set speed records for Atlantic crossings. With ten decks, the liner will register a gross tonnage of 34,000.

## Aerial Camera for Fast Plane Carries 500 Feet of Film

Designed for today's fast airplanes the latest aerial camera has 500 feet of film, enough for more than 600 exposures. Old-type cameras, with only 100 exposures, had

to be reloaded so often that valuable time was wasted. Since it takes about ten minutes to reload, the new camera enables photographers to spend about an hour more each day actually taking pictures. The camera takes pictures nine inches square. It is made entirely of a lightweight metal and has no moving parts between focal plane and the lens. The film is held flat by vacuum pressure. A metering device insures a uniform space between exposures with minimum waste of film. The camera is equipped with a wide-angle, eight and three-quarters inch lens.



Latest aerial camera is shown on ground beside fast plane for which it was designed. Note plane's visibility

*Albans Aerial Survey Corp.  
606 E. Shawansee St.  
Lawrence, Mich.*

*Ex photo photo machine*



# Thirteen-Mile Water Tunnel 'Holes Through'

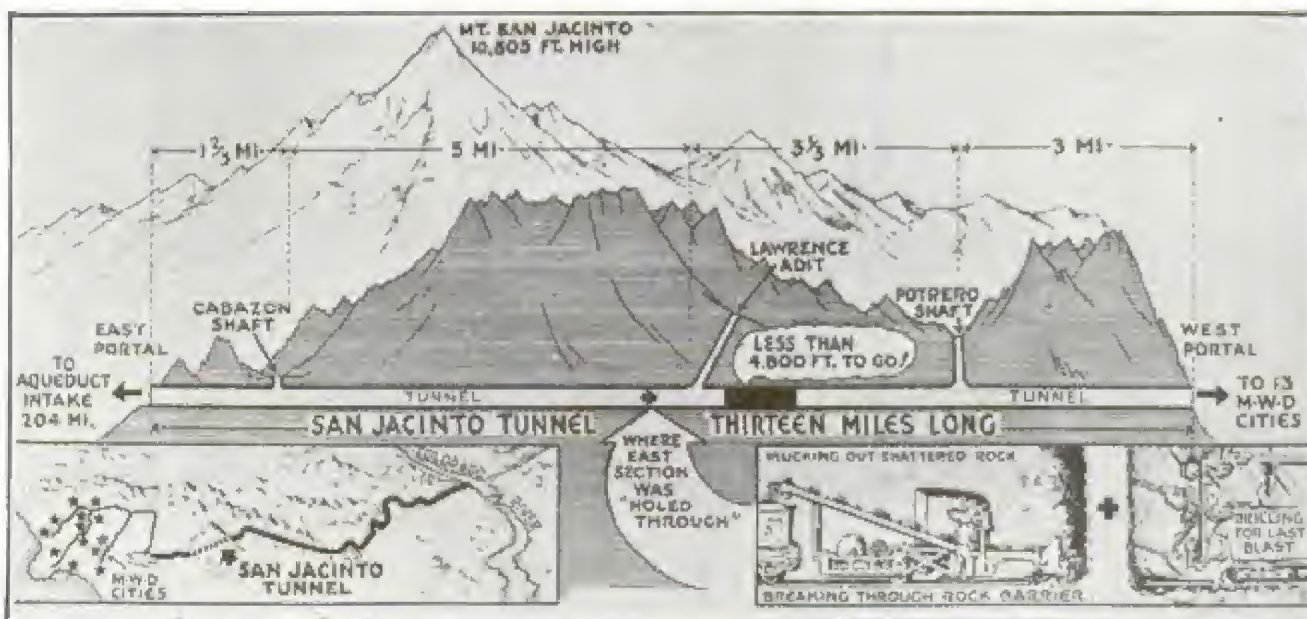


Diagram plots the San Jacinto tunnel, second in length of thirty-eight rock bores on aqueduct destined to carry a billion gallons of water daily to thirteen California metropolitan water district cities

One of the toughest engineering problems on the 392-mile aqueduct that soon will take Colorado river water across desert and mountain to southern California was boring the thirteen-mile tunnel under San Jacinto mountain. The eastern section was "holed through" recently, leaving less than 4,800 feet of the western section to be completed. The tunnel pierces a shoulder of the 10,805-foot Mt. San Jacinto

and its construction has been made extremely difficult by heavy, broken rock and large quantities of water under high pressure. This particular tunnel is, however, only the second longest of thirty-eight hard-rock tunnels totaling 108 miles, nearly one-third of the full length of the aqueduct. When completed the waterway will carry a billion gallons a day to thirteen cities in southern California.

## Telephone Wires Are Plowed Under to Eliminate Poles

They're plowing under the telephone wires in Ohio, and it's goodbye to the strings of telephone poles lining the country road. Traveling at a slow walk, a spe-

cially built plow turns a furrow twenty-four inches deep and drops in the wire, which is fed from big spools like thread through a needle. At the same time a tin-covered copper strand is laid for a ground wire. Motive power for the plow is supplied by a tractor, truck or winch. Engineers for the Ohio Bell Telephone company have started the plowing operations in Summit county.



Telephone wire is fed into the ground from these spools as the plow turns up a furrow twenty-four inches deep

## House Built of Ashes Is Weatherproof

Waste ashes were used as a building material in an experiment in low-cost housing, and the result was a six-room home as sturdy as one of brick, resistant to



vermin and to temperature changes. The material was ninety-five per cent ashes, five per cent sand and cement, with soap for a waterproofing agent. The specimen building was erected in a south African city by three unskilled laborers at a cost of about \$1,100. The waste material was poured as a liquid into molds, solidifying quickly.

1953

### Read-as-You-Eat Lamp Holds Paper on Dining Table

Next time you breakfast in a hotel, perhaps you will find the morning newspaper propped up on one of the new "read-while-you-eat" lamps. A ten-inch metal shade reflects the light of a seventy-five-watt bulb down upon the newspaper, held at a convenient angle by an adjustable bracket. A ruby light on top of the lamp signals the waiter.



Morning newspaper is propped against lamp bracket

## Sky Ladder of "Windmills" Lines Up at Autogiro School



Six wingless autogiros flying in echelon formation with student pilots at the controls are caught by photographer over Wright Field at Dayton

In these days of mass airplane flights and sky parades in formation, a formation flight of autogiros is still relatively rare. A photographer climbed high over Wright Field at Dayton, O., the other day to "shoot" a sky ladder of "windmills." Members of a class of student pilots were putting their wingless autogiros through drill in echelon formation.

### Radio Waves Heat Up a Rivet in World's Fair Building

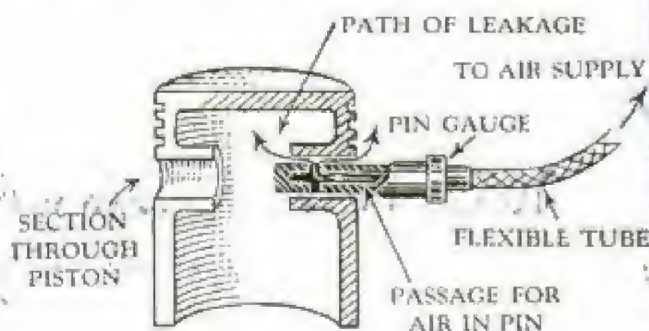
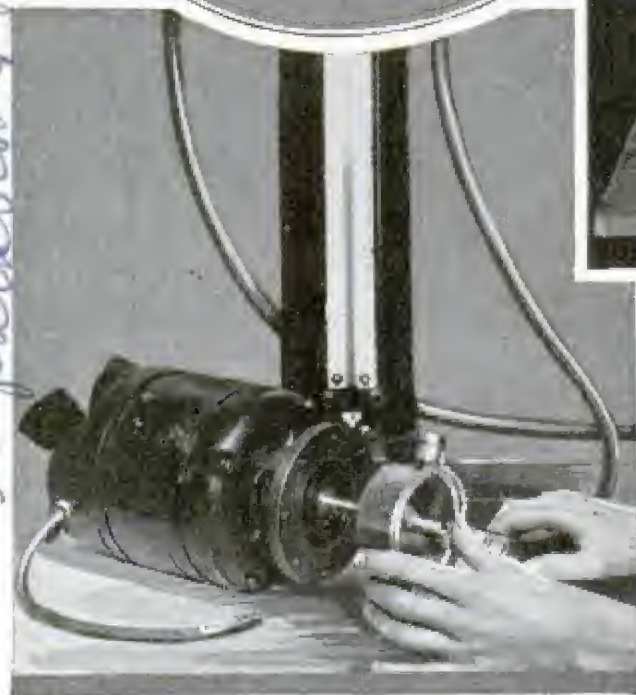
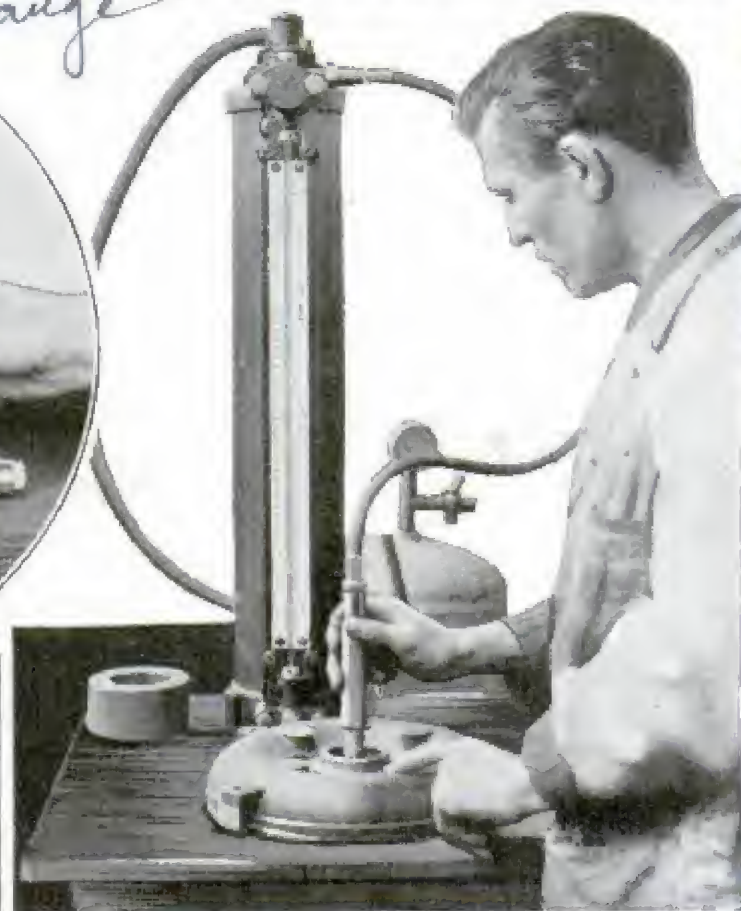
Just to demonstrate what radio waves can do when put to work, the last rivet driven into the steel framework of the RCA exhibit building on the New York World's Fair grounds was heated by radio. The oscillator of a regular radio transmitter was set up in the building, but instead of directing its output into the usual antenna, it was directed into a coil of wire. This concentrated the radio waves in the center of the coil instead of broadcasting them, and it took just a bit over a minute to heat the rivet white hot.

my James H. G. Co.



# Air Flow Indicator Measures Precision Parts

*Solex Pneumatic Gauge*



Testing a piston and other automotive parts with air flow gauge. Leakage of air between pin gauge and part is translated into pressure easily read on vertical gauge. Cross-section diagram illustrates operation

Extreme accuracy in the measurement of precision parts is obtained by the use of a gauge sensitive to air flow. The leakage of air in a tiny gap between the gauge and the part being measured is shown on a pressure gauge and is in proportion to the clearance between the parts in contact.

Air is fed at a fixed pressure into the hollow pin gauge, and slots let the air escape between the wall of the hole and the outside of the pin gauge. So sensitive and so easily read is the pressure gauge that measurements of five hundred-thousandths of an inch can be taken accurately.

## Four-Wheeled Trucks on Railway Coaches Give a Smoother Ride

Greater riding comfort is afforded by a new type of trucks for railroad coaches, it has been found after four years of research by the Milwaukee Road. The truck has

four wheels instead of the six on the standard truck now in use. Twenty-eight coil springs arranged in six nests replace the elliptical springs, resulting in greater re-

*Emt. Lawrence Lederer 11/16/11*  
*Walsh 11/16/11*



siliency. A levelizer bar, which equalizes the load on both sides of the truck if one side becomes overloaded, is another innovation. Two snubbers, similar to those used on automobiles, are installed on each truck to stabilize the car and a one and one-half inch cushion of rubber placed under the center board of the car deadens noise. Test instruments show that cars equipped with the new trucks and rubber cushion are subject to less sway and bumping, and that they are considerably less noisy. The new trucks weigh 29,000 pounds, compared to 40,000 to 45,000 for the six-wheel type. Since it costs nine-sixteenths of a cent per year to haul an ounce of dead weight, the savings on weight alone will amount to several hundred dollars per year on each car, according to railway experts.

## Five-Foot Model Seaplane Takes Off, Alights on Water



When he was not busy piloting a sky liner between Fort Worth and Los Angeles, Capt. Hap Russell built this quarter-horsepower model

Taking off from the water under its own power, a seaplane model built by an air-transport pilot can fly for ten minutes and glide down to the water again. It is built of balsa wood and has a wing spread of five feet eight inches and a fuselage thirty-eight inches long. The motor develops one-fifth horsepower at 5,000 revolutions and one-fourth horsepower at 6,500, and flies thirty seconds on one ounce of gasoline. Capt. Hap Russell constructed the ship in spare time between runs on the Fort Worth-Los Angeles route.

## "Hippo" Car Can Roll or Swim with Ten Passengers



German officers cross a river in their amphibian car, which travels seventy-two miles an hour on land and twelve miles an hour on water

Bridges might save time, but they're not necessary to the German army's new amphibian automobile. Carrying as many as eight or ten men, it can drive right off the road and "swim" across a lake or river at twelve miles an hour. Top speed on the highway is seventy-two miles an hour. From the front the car resembles a hippopotamus.

Send postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.



## Baby Rides in a "Rumble Seat" When Daddy Goes Fishing



*Playing nursemaid is no deterrent to a day's fishing when you can carry the youngster on your back*

There was no use in staying home with the baby when his wife was away, a Miami man decided. So he rigged up a seat slung over his shoulders for the youngster, attached a sunshade, and now the baby goes along whenever daddy fishes.

## Additional Sources of Rubber Guard Against Shortage

To guard against a shortage of supply, new sources of rubber are being developed in the United States and other countries. Whereas the hevea plant has been the principal source of rubber, the guayule plant is fast developing as a substitute. The guayule is different from the hevea in that its latex is contained in cells which do not communicate, therefore the latex does not flow when the bark is cut. However, an extraction plant is in operation, taking rubber from the guayule by cutting, drying, cutting into short lengths, cleaning and then pulverizing in water.

The pulp is then treated and the rubber obtained. The guayule supplies rubber by this method after four years' growth. Auto tires were made from this rubber in 1934. The guayule, therefore, might be a source in case the supply of imported hevea rubber should be cut off in emergencies. In Russia, experiments have been conducted on more than 150 plants capable of yielding rubber. The most encouraging results have been obtained with the chondrilla, a plant which grows in profusion in Turkestan and Transcaucasia, and with the "kok-sag-hyz," which is being cultivated in southern Russia.

## Japanese Beetles by the Quart Caught in Bottle Trap

Twenty thousand Japanese beetles are captured every day in the forty traps set for the insect pests in the Bronx Botanical Gardens. Millions of these beetles have invaded the shrubbery in the New York area and with the plague still menacing, the authorities have asked professional and amateur gardeners to cooperate in the defensive fight. The insect is about the size of a horsefly. Experts are experimenting to find the best means of killing the beetles and checking their spread.



*Collecting a quart of Japanese beetles from a trap in Bronx Botanical Gardens. Beetle is shown above*

Customize Chestnut & Chela  
claypipes  
it's all here

4975

4882

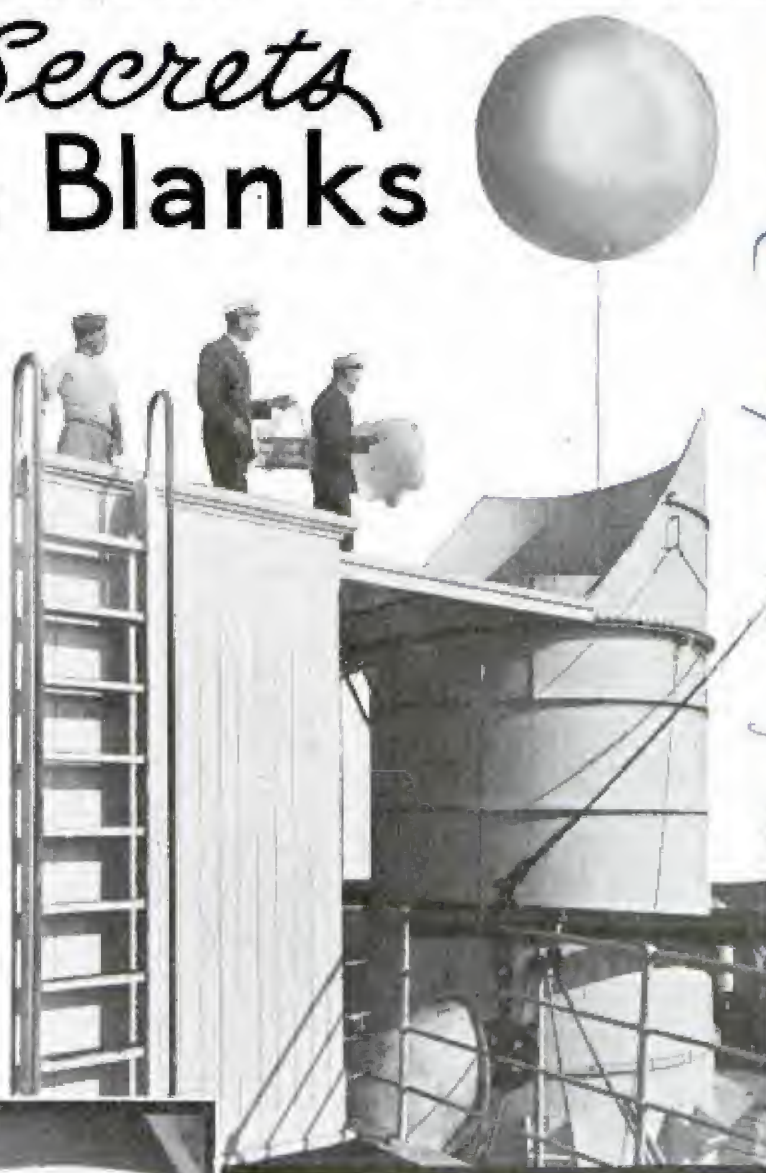


H 942  
1936. Co. 21. R. U.  
Washington, D. C.

# Ship Weather Stations

## *Solve Secrets* of Ocean Blanks

**F**AR out in the Atlantic, standing guard in one of those oceanic "blanks" whose treacherous weather has never been charted, the French ship "Carimare" is pioneering as a floating weather bureau for transoceanic ships and planes. For more than six months it has stood at a fixed point 800 miles west of the Azores, collecting data on the weather at sea and in the upper air, broadcasting marine and flying weather reports four times daily on a regular schedule. These reports are picked up by vessels and by weather stations at Paris, in the British Isles, Canada and by Pan-American Airways radio men. It is hoped that the next few years



Below, "gassing up" pilot balloons to be sent with radiometeorographs to upper air for weather observations. At top, balloon starts ascent from special launching tube on the "Carimare"

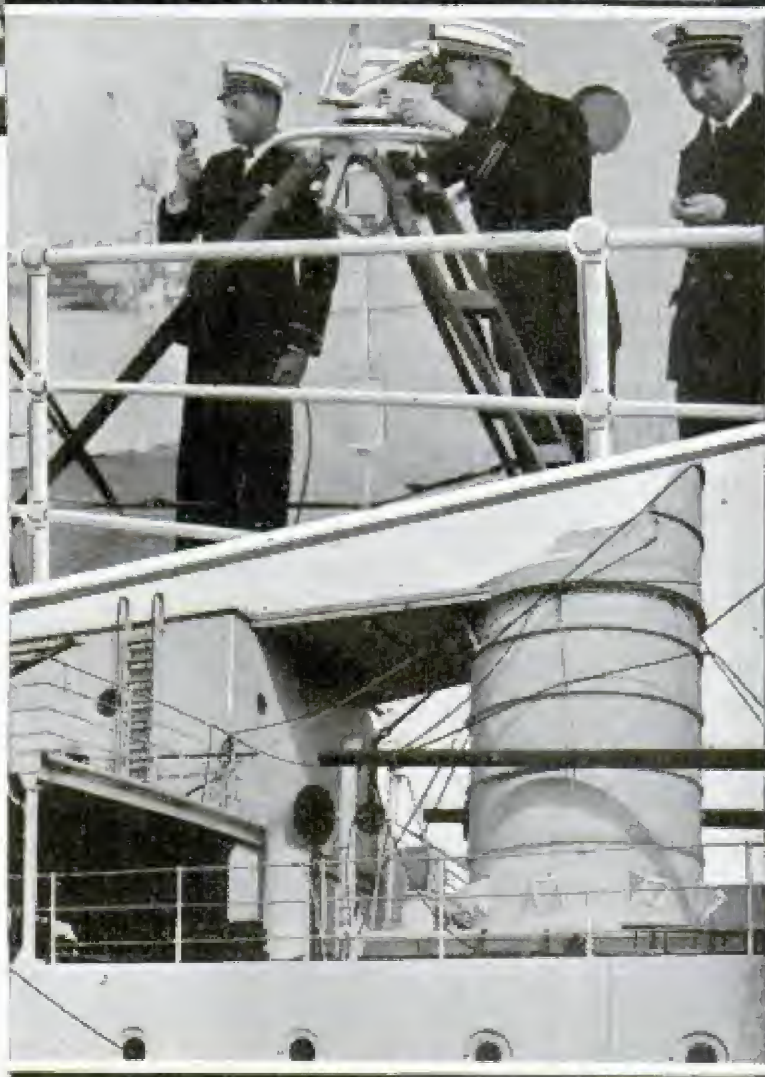
will see a chain of ten or twelve completely equipped meteorological vessels posted at strategic points in regions now shunned by all but a few daring ships or planes. There are a number of these oceanic blanks, vast areas feared by navigators because of their uncertain temper; typhoons, fogs, hurricanes beset ships without warning for want of regular meteorological observers. One covers about six million square miles between Bermuda and the Azores, a vast stretch of salt-water wilderness that has been the graveyard of many a ship and a menace to travel by air. Two other nautical blanks, not so large,

*Dep: 172  
American, upper water- international meteorological organization  
Bureau*





occur north of the Great Circle navigation route between New York City and the British Isles; one is approximately 500 miles south of Iceland, the other a similar distance south of Greenland. Permanent weather ships could, in a year or more of scientific study and record making, solve many of the meteorological mysteries of these blank stretches, and with regular forecasts available they could be opened to new steamship lanes. At present some 1,600 ships on the regular existing ocean routes take weather observations and report to the U. S. weather bureau; some several times daily, by radio, others by the week or month, and still others submitting only annual reports. Occasionally some of these ships wander or are blown by tempests into the region of doubt and make observations in passing, but these are usually inadequate both in number and accuracy. The "Carimare," once a combination freight and passenger vessel, has been converted into a fully equipped scientific marine weather laboratory. It is staffed by ten French meteorologists assisted by a crew of seventy men and officers who devote full time to detailed observations of conditions at sea and in the air above. Any ships in the neighborhood report to the



*Top, compiling weather-map data in chart room of "Carimare"; below, making observations, and the launching tube for balloons*

"Carimare" their observations of weather and overhead air currents. The ship has both sounding and chart rooms and a special launching tube from which pilot balloons and radiometeorographs are released daily to take readings in the upper air. From these readings, weather maps are compiled and data broadcast by radio.



# High-Voltage Power Line across Nation Seen

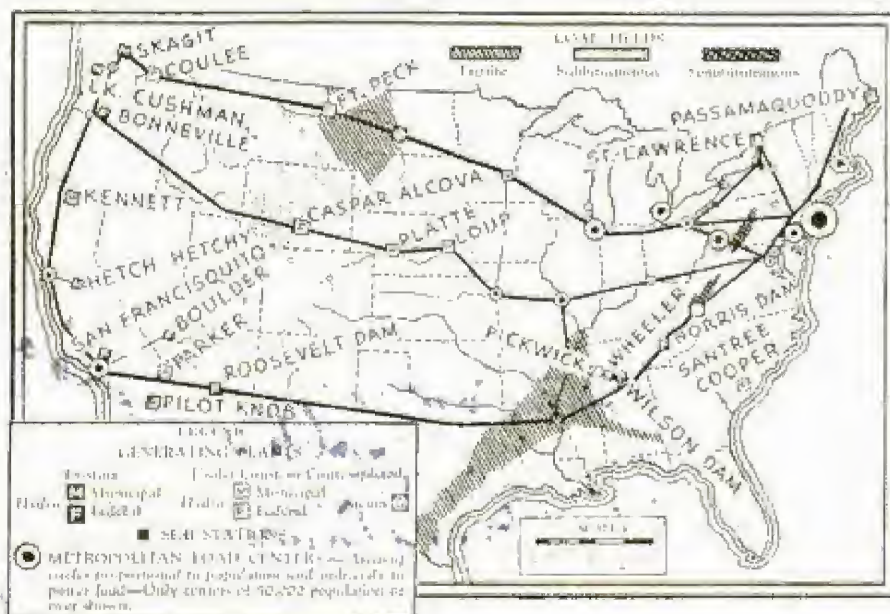
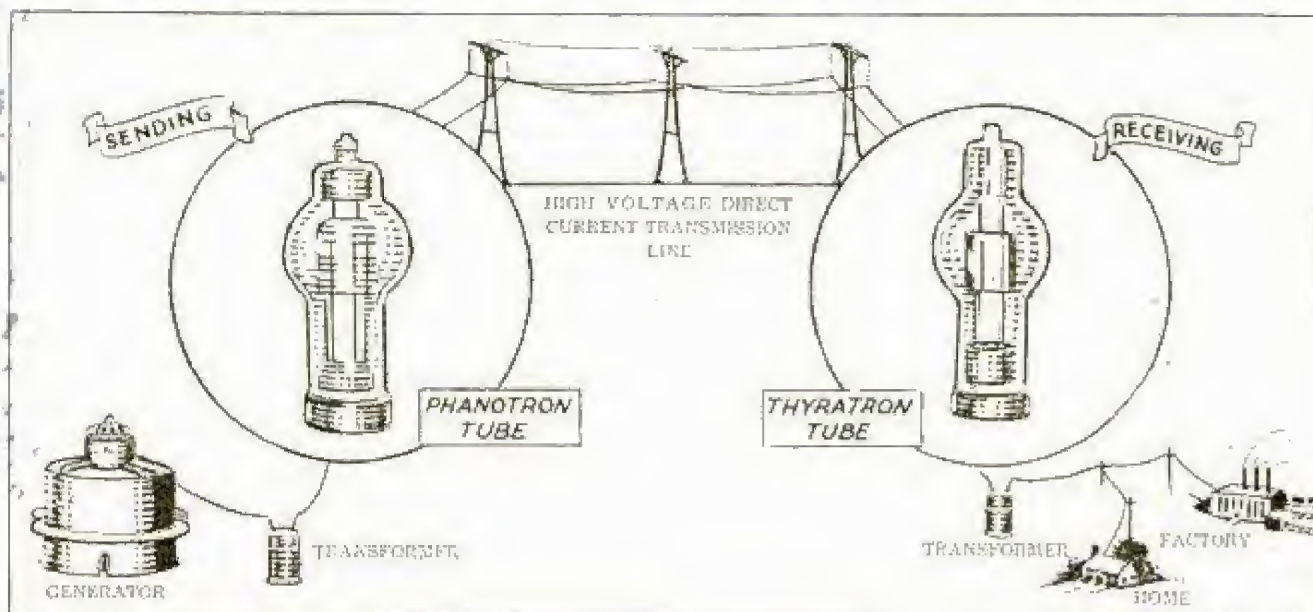


Diagram at top illustrates a high-voltage circuit. Left, prophetic map of future direct-current lines showing sources of cheap power

300,000 or 400,000 volts will be possible. One electrical engineer estimated a 400,000-volt line bringing Columbia river current to Chicago with a loss of only ten per cent could deliver 760,000 kilowatt-hours at a transmission cost of only about one mill per kilowatt-hour. Adding the cost of the power, Chicago could have power from the Pa-

Direct-current transmission lines across the continent, tying together the great power centers and making it possible to light New York City or Florida with electricity from the Columbia river, are prophesied by engineers. Power plants could be located at sources of water power or in the lignite and coal fields where cheap steam is available. Direct-current transmission is not hampered by the limitations of alternating-current lines, with their handicaps for distances over 300 miles. By using greater voltages or larger conductors, power could be transmitted for thousands of miles. At present it is possible to supply 100,000 volts direct current commercially by using large glass rectifying tubes, big brothers of the radio tubes. Eventually,

cific northwest at a cost of three and one-half mills per kilowatt-hour. If the voltage were raised to 750,000, the line could deliver 1,800,000 kilowatts to New York City—twenty per cent more than the city now uses! Last year the total electric power delivered in America amounted to 37,032,000 kilowatts, of which 10,474,000 kilowatts came from water power. Government engineers estimate there is still 52,629,000 kilowatts of water power undeveloped.

Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.



## Motorcycle Is Knee-High on Airplane Tail Wheels



This is no "bike" for chasing speeders, but it will travel forty miles an hour

Only knee-high to a motor "cop," a miniature motorcycle built in Los Angeles rolls along the highway at forty miles an hour on two airplane tail wheels. It stands twenty inches high and weighs only sixty-one pounds. Powered by a two and one-half horsepower outboard motor, this midget bike has made a hundred-mile round trip to the top of Mount Wilson, taking steep hills readily and traveling 150 miles on a gallon of gasoline. The frame was cut down from an old bicycle and reinforced. Throttle, spark and cut-out switch and brake lever are mounted on the handlebars. A friction generator for the lights operates off the rear wheel.

## Oil Jet Replaces Automobile Gears to Give Smoother Running

Replacing the gear shift and clutch, an oil system has been developed in England for application to the automobile. Instead of gears between the engine and the transmission, a jet of oil does the work. A centrifugal pump, in combination with other

means, controls the flow of this oil jet so that the driven force in the transmission and the driving force from the engine rotate relatively to one another at greatly varying speeds. The result is constantly varying gearing between the driving and the driven forces, just as if this function were being performed by gears. The floorboard is cleared of all controls except accelerator and foot brake. On the instrument panel is a small gear handle for reverse. With the motor started, the driver presses the accelerator and the car moves off smoothly, gaining speed as the gas is applied. There is no need for a gearshift on hills or in traffic, for the car moves sensitively and smoothly to the touch of foot on accelerator. Cost of the oil system is said to be much less than for that of the present gear and clutch.

## Oil Paintings on Old Bottles Prove Profitable Hobby

Turning his hobby to profit, a California orchard worker who has a flair for oil painting collects old bottles and decorates them. First painting the entire bottle a blue-gray or golden-yellow, he then paints a landscape over the background.



Californian spends spare time decorating bottles with oil paintings and sells them at local grocery

Commendatore Piero  
Salerni Italian engineer

L. H. Sweetser  
4420 Veneland Ave



# Trotting Horse Dresses Like Football Player



Above, Berengaria, a fast trotter, steps out in boots and pads for practice sprint. The sulky weighs fifty-five pounds. Upper left, adjusting knee boots; center, leather shin guards; bottom, nailing toe weights under rubber "spats"

fuzzy "collars" to prevent the boots and straps from chafing. Leather shin boots are worn on the lower legs to guard the horse from kicking himself. Rubber "spats" protect the feet. An average harness horse is worth about \$4,000. He pulls a \$225 rubber-tired, ball-bearing sulky and wears \$140 worth of special harness. He undergoes a long training period and careful grooming for the few minutes of dirt-track running that brings triumph and a share of purses as high as \$75,000 for a week's meet, or just an "also ran" mention. Fast trotting is not a natural gait for a horse, and the fast gait of Messenger, a gray stallion brought from England in 1800, gave the sport its first impetus. His sons and daughters inherited the gait, then another great trotter in 1848 started the Hambletonian strain named for him. To increase a trotter's speed, three-ounce toe weights are nailed on the front hoofs to make the horse step higher, and so take longer strides.

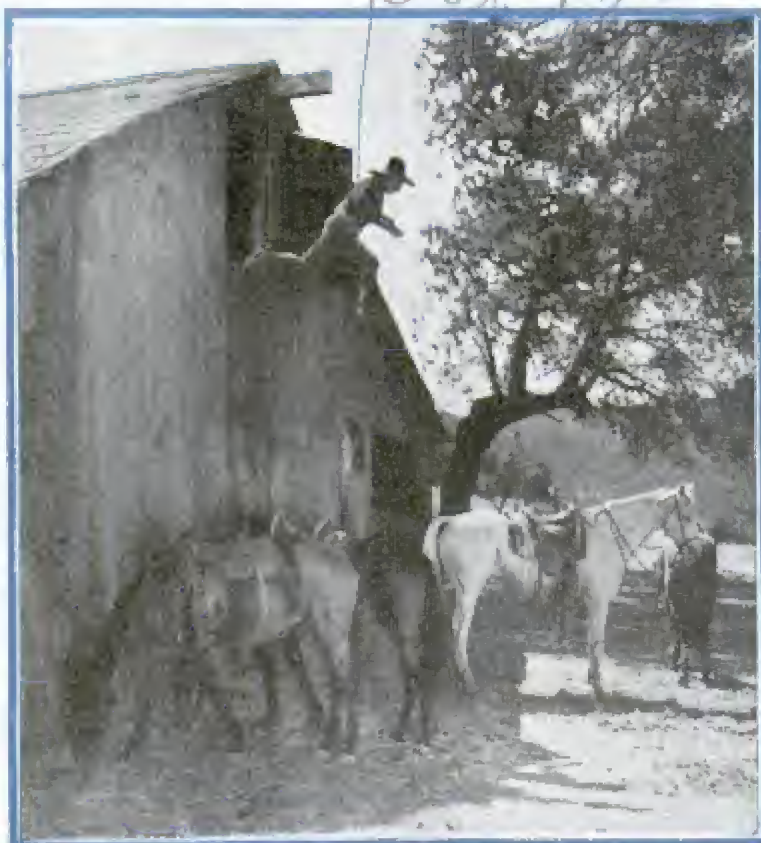
Harness racing is an expensive and precarious sport, and the trotters that get into the Hambletonian and other leading sulky races take no unnecessary risks of life and limb. Perhaps limb should come first, for after all, a trotter's limbs are his livelihood. So he wears knee boots, held in place with leather and web straps with

¶If all the people in the United States assembled at one spot and shouted their loudest, they could only register about 150 on a decibel meter—representing 600 watts.

General Electric Decibel  
Aug 19 38 346

Track at Southview, Ky.





at any speed desired. And as a secondary safety, they spliced a heavy wire into the cable about fifteen feet from the ground. This wire slanted upward, so no matter how fast the pulley was traveling, the tension of the separated cables would bring it to a gradual stop."

But how about the fellow who was to be bumped? The script said the attacker was to kick him in the back with both feet. The speed of Cliff's descent, plus the force of a two-footed kick, could break his back. The answer is "timing," working by seconds and split seconds.

Three trial slides established the elapsed

count required to put Lyons over the spot where his victim was to stand. The same time, in counts, was used by the man on the rock to get himself ready to plunge into the water at the slightest touch. This permitted him, when Cliff called just before kicking, to relax and give way as the feet struck.

"Whether it's bulldogging steers, taking riders out of saddles, tipping stage coaches, doing plane stunts, crashing automobiles or going through a fist fight, timing is everything," says Lyons. "If one fellow gets out of time in a fast fight before the camera, somebody is going to get hurt—and half a second spells the difference between a smooth scene and a broken nose."

Leaping from trees and roofs into saddles and upon passing automobiles calls for split-second timing. Misjudging the position of

a horse by inches in such a leap is liable to end a "stunter's" career. Ione Reed, one of the best known stunt women, almost lost her life because a scene was not timed.

"The scene," she relates, "called for three of us to jump off a moving freight in the path of an oncoming passenger train. We were to run forward along the tops of the cars, climb down, jump off and scurry across the tracks in front of the approaching locomotive. Had we rehearsed and timed it, all would have been simple. But it looked too easy. And it would have been, if the two who jumped first had given me sufficient time. But they didn't and



Getting off the seat and on front axle just as wagon cracks up takes quick thinking and good muscles. Top, Cliff Lyons takes a short cut to land in the saddle



I had no time to climb down to the bottom step, but had to jump while half way up the side of the car. I fell and rolled off the track. The locomotive was so close I felt the rush of the passing wheels.

"Another time, while doubling for Gracie Allen in a scene involving riding the back of a bear that is climbing a tree, a slip in timing gave me an embarrassing moment. The bear was going up the tree, after hot cakes the trainer was holding. I climbed on his back and the wire from my belt to the catwalk overhead was supposed to carry most of my weight. But the operator of my line wasn't in step with the bear, and soon my full weight was on his back. This interfered with his progress toward lunch and he turned to give me a nip.

(Continued to page 118A)



*Gracie Allen*

*Gracie Allen*



*Gracie Allen*

*Gracie Allen*

*Gracie Allen*

Top, a trusting stunt woman and an elephant. Bottom, left, stunt man doing dangerous fall.

Center, a lion turns on a stunt performer. Right, a fall requiring perfect timing



# Steel Blades of Sky Liners on "Dress Parade"



*Mechanic at Kansas City airport checks in a shipment of more than a score of shiny propeller blades soon to haul transcontinental sky liners across the country*

Standing in gleaming array, one of the largest shipments of steel propellers ever delivered to an air transport company were lined up for "dress parade" on the

Kansas City airport recently. After being checked in by mechanics, the "sky hooks" were assigned to haul TWA liners across the skyways of the continent.

## Electric Stylus Etches Hard Metal with Identifying Mark

To etch a permanent identification mark or label on tools, gauges and similar hard-metal parts, an electric stylus has been de-

veloped. It has two available points, one of copper that can be sharpened for fine marking, and another of a special alloy for ordinary etching. The depth of the marking is controlled by speed of movement or by adjusting a switch.



*Etching a permanent identification mark on hard metal with the electric stylus*

## Milk Used to Be Just a Food— Now It Really Goes Places

Do you remember 'way back when milk was merely something to drink? It has gone a long way since industrial chemists discovered a few years ago that it is a valuable raw material for the manufacturer. Buttons and blankets, paint and plastics, billiard balls and cups and saucers are a few of the products of milk today. They are made from casein, the protein of milk. Casein glue is a plywood binder, casein paint clings to the wall and keeps its color, casein plastics take a high polish and any

*Amesbury Chemical  
Society. 330 W. 42nd*

*Hand deal Commutator  
and Dresser  
Sawmore, d. d.*

*12842*

*no*



Midwestern  
System American  
Chemical  
Society

Comp. Caterpillar  
Tractor Co  
Peoria Ill.

tint. In Wisconsin alone 300 plants turn out nearly 16,000,000 pounds of case-in a year. It is used more for coating calendered paper than for all other purposes combined, furnishing a fine gloss. Case-in wool rugs and suits and blankets are on the market or projected. Sizing for window shades, dressing for linoleum or leather, buckles for dresses and barrels for fountain pens, toilet articles and imitation jade—these are but a few of the many products you meet every day that once were just plain cow's milk.

H 860.

### Model Rock Houses Built by Disabled Stone Mason

Unable to work at his trade because of a leg injury, a California mason has turned from big buildings to miniatures. He builds model houses of stone, exhibiting them at a roadside stand for sale as decorations for rock gardens.

Beaumont, Calif.



Stone houses and tower built for rock gardens by a mason who is kept from regular work by a leg injury

## Twelve-Wheel-Drive Truck Carries a Mountain of Dirt



This tremendous materials truck has a capacity of forty-three yards and its Diesel engine is geared to four sets of triple drive wheels

Inexpensive to operate and a glutton for work is the fourteen-wheel truck that has been doing flood-control work around Los Angeles. It has twelve drive wheels, two sets of triple wheels on each side at the rear. They are demountable disk-type wheels, twenty-four by twelve inches. The truck can haul a forty-three yard load, and on a four-mile haul handles an average of eighty-five cubic yards of material per hour on about three and one-half gallons of inexpensive Diesel fuel oil. A sliding bulkhead in the body unloads the truck in forty-five seconds by pushing the load out and spreading it simultaneously. The power plant is a 180-horsepower, eight-cylinder Diesel. There are three speeds forward and one reverse, and an overdrive providing a forty per cent increase in speed to give a top speed of twenty-five miles an hour empty and fifteen miles loaded; an underdrive provides two-one reduction allowing ample pulling power on grades.

Caterpillar

☐Inquiries as to makers of articles described in Popular Mechanics will be answered by our Bureau of Information upon receipt of return postage.

Troyan Truck. 629 E  
Valley Blvd., Beaumont  
Calif.

B. L. C. (Burr) Brown

L. H. Sweetser  
4920 Vineland Ave.

1 (B. L. C.)





# "LIFE GUARDS *with*

**E**ARTHBOUND and surfbound for more than five generations, it is only in the last decade that wings have become an important and necessary adjunct of the Coast Guard. From an inauspicious beginning in 1921, the aerial branch of the service has grown to include eight major air stations and two patrol detachments operating almost sixty aircraft, with two more detachments planned.

In 1937 alone, Coast Guard pilots on rescue missions scanned more than 5,800,000 square miles of land and sea, making 3,842 flights. Assistance, in the form of medical aid or transportation, was given in more than 1,000 cases and 168 vessels were warned of danger. Nearly 600 persons likewise were warned of some impending peril. Other government departments were given a helping hand more than 400 times, thirty-seven ships engaged in smuggling were located and two air smugglers trailed successfully by Coast Guard planes.

The first flying equipment of the service consisted of small single-engined planes carrying a crew of three, able to cruise only 400 miles at eighty land miles per hour and dangerous to land except in fairly smooth water. Today, the giant two-engined long-range flying boats of the Coast Guard can cruise more than 2,000 miles non-stop at more than 125 miles per hour, carrying a crew of six and are able to land in rough water far out at sea to pick up twenty or more people in an emergency.

These new rescue boats were especially planned and constructed for Coast Guard work. The service cannot use standard models of airplanes due to the rigorous use to which the craft must be put. Seaworthiness, ruggedness and range receive first consideration. Speed comes after. A fast airplane isn't much good if it can't land safely in a pounding sea. There was much trial and error building before suitable





# WINGS"

flying equipment was found.

Maintenance and preparation are the two prime factors which help to keep up the splendid record of our "aerial life-guards." An instance is found at the new Coast Guard air station at Floyd Bennett Field, Brooklyn, N. Y. The hub of activity is the giant hangar which stores a fleet of eight aircraft of varied types. Fifty men and six commissioned officers are provided with full living quarters and recreation facilities. In addition, the hangar contains carpentry, machine and propeller shops, etc., weather station and radio communications room. Complete equipment is stored for the beaching and launching of over-water aircraft. A roomy concrete apron leads directly to



Top, carrying ashore one of the survivors of plane which crashed in Jamaica Bay. Bottom, communications room at coast guard airbase at Floyd Bennett Field





a seaplane ramp down which planes are towed for launching.

The station's fleet covers an area of 70,000 square miles of water and an inland area extending over four states. Only the use of wings enables them to perform their duties over such an extensive territory. Duties of the fleet range from law-enforcement and rescue activities to patrolling regattas, reporting wrecks and flood relief and hurricane activities.

Planes are checked after every twenty hours of flying, including overhaul of engines. Every single part of the plane is inspected. In times of emergency, this limit may be extended to thirty hours, but never more. Major overhauls are performed after 1,000 hours of flying, or, if that flying time has not been reached, after a three-year period. Take-offs are never made hurriedly, except in extreme emergencies.

Although the main duty of the base is operation of aircraft, its radio communications system is equal to any calls that may be made upon it. The present system is to have all communications worked via teletype from an adjoining Coast Guard communications unit. However, direct communication is always maintained with airplanes in flight while out on patrol or performing rescue duty. Incoming service aircraft from other stations are also kept in direct communication. This extensive network of radio also serves to calibrate positions of aircraft or vessels at sea by means of direction-finding triangulation. All planes carry an extensive complement of radio. The over-water craft, in addition, have installed modern direction-finding units covering all wave frequencies. Fog and darkness hold little terror for the Coast Guard airman—he knows his radio will not let him down.

A fully-equipped Coast Guard plane is practically a little base in itself. In addition to radio, all offshore patrol aircraft carry six to eight-man rubber life-rafts,



Top, commanding officer after inspection flight over metropolitan area near new airbase.  
Bottom, coast guardsmen rescuing crew of grounded freighter off New Jersey



life preservers, blankets, etc. When assigned to flood or hurricane relief duty food supplies, stretchers and medical kits are added. Due to the great mobility of the airplane, it is not unusual for planes from New England and New York to be assigned to Florida for emergency duty. An eight or nine hour flight brings them on the scene. The planes are particularly effective as aerial ambulance and rescue units at such times.

A good deal of the Coast Guard base's efforts is directed towards preventive duties. Thus, every day at least one plane makes a routine patrol and survey flight to see that all is well. If any small craft are too far out, or seem to be heading into rough water, etc., the plane radios its shore base and the message is turned over to one of the many surface stations dotting the coast. When the barometer begins to drop, indicating the approach of a storm or hurricane, a Coast Guard plane takes to the air and flies far out at sea bearing warning

(Continued to page 122A)



*St. Louis  
multi  
recul  
of fuel  
air  
bas*



Top, aiding survivors of plane crash. Circle, mapping course before taking off on patrol flight. Bottom, launching lifeboat at Cape May, N. J., Coast Guard station



## Wheeled Produce Basket Displays Goods at Door



Top, fitting basket into recess in truck. Bottom, rolling it over curb to customer's door

Rolling on six wheels, a metal basket which carries 100 items of fruits and vegetables enables a California vendor to display his goods at the customer's door. This eliminates the necessity for the customer to examine the vegetables in his truck. The basket fits into a recess at the rear of the truck. It balances on two center wheels, with smaller wheels at the ends to facilitate climbing over curbing.

## Mining Banned Near Palomar to Guard 200-Inch Telescope

So delicate is the 200-inch telescope lens and other instruments being installed in the observatory at Mt. Palomar, Calif., that mining operations within a three-mile range of the observatory have been forbidden by act of Congress. Every effort is be-

ing made to prevent the slightest shock to the equipment. Visitors will not be admitted to the structure until the visitors' gallery is completed, probably next year.

14950

## Fish Lure of Colored Plastic Has Electric Light Inside

Brightly colored to attract fish, a lure made of translucent plastic is even more enticing when its electric bulb is turned on and the light shines through the brilliant case. The lure is available in various shades. It is easily disassembled to renew battery or bulb, or change hooks.



14896

## Merchandise Labels by the Roll Run Through Typewriter

Small, blank labels for marking merchandise are now available in rolls which can be run through the typewriter. The strip need not be removed from its container to be inserted in the typing machine. Backed by a special adhesive, the labels are easily removed from the strip or, afterward, from the merchandise, and no moisture is used in affixing them.



Roll of blank adhesive labels is fed directly from package into typewriter to be marked

W. N. Dillmore, 240 W. Parrot St. Alhambra, Calif.

Every Adhesive

Christian Science Monitor 5/11/38  
Dure-Capac Large and 972 23 primary fields a 2000



# Queer Ways of Fishing with Lance and Gun



The hand must be as quick as the eye when you're spearing fish. The young lady, above, has just stabbed a nice meal for herself, using a Japanese-type glass mask as a "window" for searching beneath the water.



Instead of the hook, the harpoon gun is used by "hunters" seeking small game fish in low waters around Miami, Fla. This gun, shown above, fires a six-inch arrowhead harpoon, then the fish is reeled in. Notice reel under muzzle of gun.



Goggle-fishing is a marine sport growing in popularity along Carolina and Florida coasts. Armed with lances, swimmers descend as far as twenty feet and "stalk" their game. Fisherman at left is starting down for a look at fish through Japanese-type mask, which protects both eyes and nose. Coming up with small fish on his lance, at right, is sportsman wearing goggles, each eyepiece being watertight.

The Caffrey Hardware Co. San Francisco, Calif. April 6-7-5

*Jacqueline Paulk*

*see letter*

*see June 1939 915*

*2500 Swabed Cherry*

*James Maurer Hein*

*K. Kaya Co. Sweet*

*Aeme*

*1.50 paid.*

*Oceanport, N.C.*

*sheephead*

*Mr. Hubert Prytheigh, Elmer Mays, W. A. Fanel, S. Malye*



## Starter for Model Engines Spins 'Prop' with Spring



Coil spring inside "flashlight" case twirls prongs and "winds up" motor of model airplane

Starters for model-airplane engines are now available. Instead of twisting the propeller by hand until the motor takes hold, you wind up the coil spring of the starter, which resembles a flashlight with two rubber-sheathed prongs where the lens would be. Then, centering the prongs over the propeller hub, you press a starting button with the ball of your hand and the cranking arms spin the propeller. Tension is adjustable to suit the motor. Since the starter arms are held by a ratchet, they spin freely without interfering when the engine begins turning. As only one hand is needed to hold the starter, the other can grip the airplane.

## Record Disk for Eye and Ear Teaches Foreign Language

Phonograph records which teach foreign languages by eye and ear simultaneously are reported from Japan. Two records are employed, both of them cardboard disks. One, slitted from edge to center, is placed above the other. Words and instructions

are written on each side of the slit and a needle running through the slit points to words while the sound record simultaneously provides the proper pronunciation.

## "Photographic Eye" at Its Best Spans Only Eight Words

Perhaps you have a "photographic eye," but there is no such thing as a photographic eye capable of taking in a page of print at a single glance. A study of the eye movements of readers showed only one who could span six or eight words at a glance. The average reader in a college-educated group had a span of 1.25 words.

## Store Awning of Sheet Aluminum Saves Replacement Costs

Tiring of the need for periodical replacement of worn-out canvas awnings, a storekeeper at Badin, N. C., had a permanent awning of thin sheet aluminum built in front of his shop. Its rigid framework was made of standard pipe fittings and the aluminum covering was riveted in place. Daily furling of the awning is eliminated, and the aluminum is virtually indestructible by weather or age.

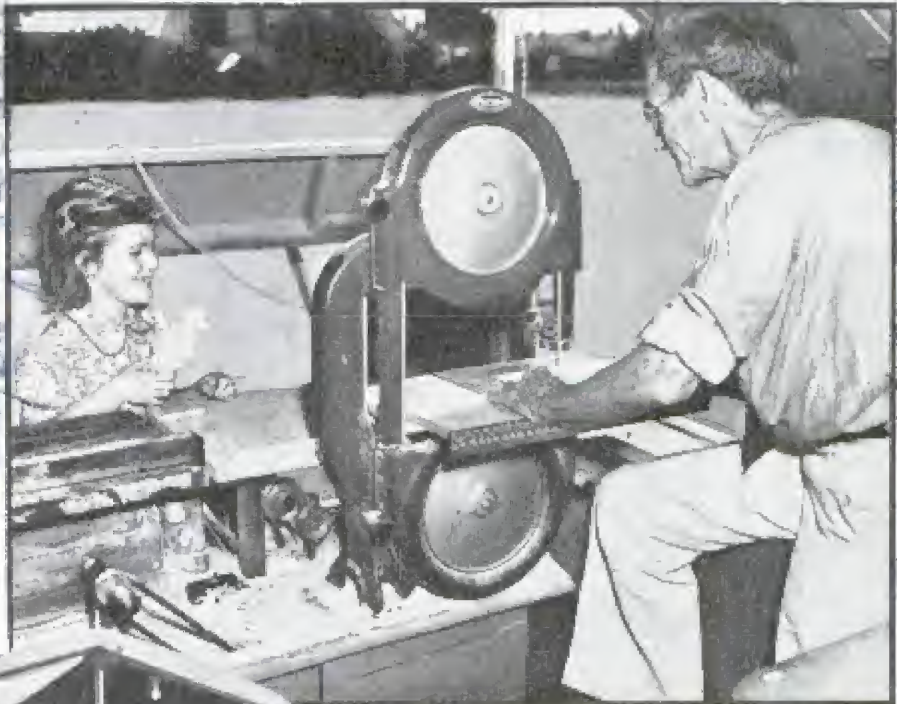


Aluminum awning keeps window cool by reflecting heat, and lasts indefinitely. It is riveted on pipes



# Traveling Woodworking Shop Tours Schools

Making the rounds of schools and playgrounds in Pasadena, Calif., is a complete woodworking shop on wheels. Built on a truck chassis, it includes a circular saw and band saw, lathe, electric drill and small planer. Its power is taken by a long cord from the regular 110-volt circuit of whatever school ground the truck visits. It is equipped for model building and for teaching handicraft work in schools lacking workshops of their own.



Top, a pupil at Pasadena school watches band saw at work. Left, the traveling woodworking shop "open" for business. Touring from one school to another, it plugs motor in on 110-volt circuit

*Comb. blm. Spawne. 1st Car news. Pasadena Calif.*

## Ladder Bracket for Painters Locks Firmly on a Rung

Strong enough to support the weight of five men, a ladder bracket for painters, carpenters and other building mechanics can be locked firmly on a ladder rung. Once in position—one hand can lock it there—the bracket cannot come loose, there are no projecting parts to stumble on and the scaffold plank can be placed easily. The bracket can be used on the top rung of an extension ladder. A guard rail may be added.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.



Five men are supported by bracket on ladder rung

*86 50 1st factory pend. E. L. Weaver Co. 12 years 1st*



## Super-Pyrometer Tests Heat from Your Hand or the Sun



Focusing this sensitive instrument on any heat source, the scientist can read instantly the degrees of temperature radiated

Focus this supersensitive pyrometer on your hand, on a fire six miles away, or on the sun, and it tells, instantly, the degrees of heat radiated from that source. Invented by Dr. John Strong of the California Institute of Technology, this instrument is to be used experimentally with the new 200-inch telescope. It may prove of practical value to astronomers, fruit growers, weather observers and in other fields. When the pyrometer is focused on any heat source, the infrared heat waves strike its rock-salt lens and are concentrated and filtered through quartz-crystal elements which eliminate all but the actual heat radiation. The "purified" heat wave then strikes tiny bits of gold leaf, coated to prevent dissipation or reflection; then it reaches two nearly invisible wires of bismuth and alloy of bismuth and is converted into electric current. This is measured by a highly sensitive galvanometer and translated into degrees of temperature. In a practical test, the instrument checked the heat emanations from various types of anti-frost heaters in California citrus

groves. Dr. Strong believes that eventually all phenomena of sight, sound, heat and radioaction may be "tuned in" at great distances with such instruments as this pyrometer, activated without moving parts, amplifiers or any outside power source other than the ether itself.

## Nose Mask for Stratosphere Leaves the Mouth Free

Looking toward the day of regular passenger flights in the sub-stratosphere, a Rochester, Minn., physician has devised an oxygen mask which fits over the nose and leaves the mouth free for conversation, eating—and comfort. The mask was tested by officials aboard a Northwest Airlines plane at 20,000 feet, flying from Minneapolis to Los Angeles. Such a mask would make it unnecessary to provide airplanes with hermetically sealed and supercharged cabins for flying at high altitudes and would permit the pilot to talk over the radio without having to remove the mask.



Air-line engineer riding at high altitude tests new oxygen mask that leaves mouth and eyes free



## "Old 168" Quits the Rails to Be a Monument



Side by side on rails at Colorado Springs are little "Old 168," veteran that went to work in 1883, and a big youngster hauling trains on Denver and Rio Grande Western. The old timer is now a monument

Working days are over for "Old 168," the little narrow-gauge steam engine that snorted up the mountain grades of Colorado for fifty years. The Denver & Rio Grande Western railroad gave its veteran a new coat of paint recently and presented

the locomotive to the city of Colorado Springs, where it will stand in a public park as a monument to progress in the state. "Old 168" pulled the first passenger train over the line from Denver to Ogden, Utah, in 1883, and was retired in 1933.

## Classroom of Glass Outmodes Little Red Brick School

Today's schoolroom with folding walls of glass is far removed from the little red brick schoolhouse remembered fondly by the older generation. The most advanced ideas in school construction are represented in a new open-air school at Suresnes, near Paris. Simplicity, beauty and health were the aims. Each classroom is a separate unit with glass walls. The school is set in a park with wading pools. Each room has glassed shower baths and light, unbreakable furniture.



When the high glass walls of this French school are folded back the classroom is virtually flooded with light and fresh air



12982  
V.C. De Lafoz, Fire Watcher, U.S. Forest Service,  
Box 731, Pasadena, Calif.

# LIGHTNING-DODGERS



grounding the circuit. By now the storm had closed in. The tower shook from the thunder clap as a blinding flash licked and flickered at a near-by ridge. The telephone jingled in a sort of reflex action.

In the half-light of the evening the ranger could see purplish streamers of St. Elmo's fire twisting and wavering from the outside corners of his building. Occasionally a blue radiation rose and died above the stove. The air felt dead and it was filled with noise, a constant high-pitched sizzling as if a giant were

**S**TANDING on his insulated footstool and holding the telephone gingerly by his finger tips, the fire lookout had to shout to make himself heard above the static on the line.

"The dry lightning is about two miles away and the wind is south, force three. There's a new strike on Winston Ridge in the timber. The fire stick still reads Class Six. I'm pulling the switch on the phone now, but I'll stand by on the regular radio schedule."

Dropping the receiver, the ranger strode across his lookout room on the mountain top and pulled a cotton rope that led to a switch on the phone pole outside,



*Top, hoseman on truck wetting down brush in path of forest fire. Bottom, fire fighter with flame thrower starting back-fire to impede main forest fire*



*Chas. E. Stinson Jr. 14932  
10565 Holman Ave.  
Los Angeles Calif.*

# of the FOREST



dropping red-hot irons into a tub of water. The radio aerial and the metal flagpole outside were outlined in blue fog.

Weird and frightening as an electrical storm can be at close quarters, the ranger is fairly safe as long as he obeys the orders posted in the tower. Paramount is that he must not go outside. The room in which he works and lives is a protective cage. During the day the radiations that show the power of an electrical storm are invisible but the eerie sound of the discharges can still be heard. Lightning rods on the roof will pick up the force of a direct strike and lead the charge to earth through heavy cop-



*Top, city fire apparatus helps fight flames in suburban section near forest. Bottom, ranger speaking over eight-pound radio set that has thirty-five-mile range*





per cables. The cables stretch several hundred feet down the mountainside from each corner of the house and their ends are buried in pits filled with charcoal, salt, and coils of wire. The stove, the metal bed, and the metal fire-finding instrument in the center of the lookout room are grounded to the system with other cables. But it would still be dangerous for the ranger to sit on the bed or touch the stove while a storm is at its peak. The chair and stool in the room have glass insulators on their feet and during a storm the ranger sits on the chair with his feet on the stool, completely insulated from his surroundings. In some forests the rangers replace the metal springs of their beds with a rope mesh to reduce the chances of shock and some of them cook with gas instead of wood because of the attraction that a column of heated air rising from the chimney might offer a lightning bolt.

If the ranger has to chart the location of a new blaze while an electrical storm is still close he stands on his insulated stool

to make the sight. At its peak the storm might store up enough static in the metal instrument table to hurl him across the room if he happened to lean against it. Every piece of wire or pipe in the room is dangerous to touch.

Lightning does strange things and one fire ranger was knocked out for two hours when he failed to close all his windows securely. Rain beat in on the floor under one window and he walked across the moist spot with hobnailed boots just as a lightning bolt struck the rod on the roof. He came to his senses again long after the storm had passed. Another time a ranger was taking a sight of a new fire when lightning

struck the telephone line some distance away. The shock blew out the lightning arrester on the line, jumped the open switch and traveled into the house, setting a wooden instrument stand on fire and knocking out the ranger. Sometimes when lightning strikes the



*Top, fire stick in use. Center, picking up fire stick with tissue paper. Bottom, using short-wave radio from tower*

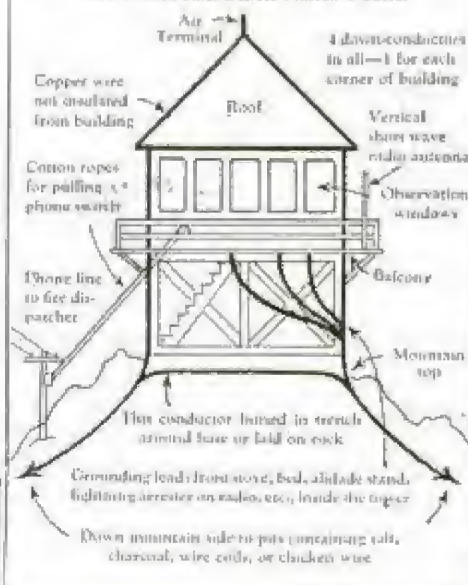


phone line small pieces of fused metal from the lightning arrester on an outside pole drill tiny holes in the windows of the lookout room as they are shot through the air.

Rain that often accompanies a thunderstorm puts out many of the fires that lightning starts but some electrical storms are "dry." Last July a series of lightning storms raised havoc with the timber reserves of the Northwest and the Pacific Coast, setting 200 separate fires on one day in the forests of Washington, Idaho, and Montana. The tremendous smoke blanket blinded rangers in their lookout stations and spread in a dense fog out over the Pacific, forcing ships to use their fog horns while steaming slowly ahead. Dry lightning strikes started nearly 400 blazes in northern California during one



Lightning Protective Cage System Used on Forest Service Fire Lookout Towers  
Heavy Black Lines Denote Protective Cables



week in the same period and twenty-two fires from lightning occurred in one night in the Los Padres national forest near Santa Barbara in southern California.

Telephonic communication from the rangers high in the mountains to the central fire dispatcher in charge of a forest district is practically impossible as well as extremely dangerous during a thunderstorm. Strangely enough, short-wave radio works as reliably during the heaviest

storms as it does in clear weather and today the Forest Service relies heavily upon radio communication. The static of a thunderstorm is of too long wave to affect the high frequencies of the short-wave sets.

Fifty-two radio sets, ranging from half-watt "S" type pack sets that weigh only eight pounds complete, to the fifty-watt main station, are used in the Angeles national forest near Los Angeles. All of the sets are of the two-way voice type and the smallest has a reliable range of thirty-five to forty miles over optical distances. The sets use a low frequency in the aviation band and an ultrahigh frequency band of from 32,340 to 36,780 kilocycles. Eight lookout towers in the forest are equipped with permanent installations for use when



Top, sighting fire-finding instrument. Center, how lookout is protected from lightning. Bottom, typical tower on mountain top

(Continued to page 134A)

*for similar articles return to Builders*



## Ice Formation on Airplane Shown in Wind Tunnel



Airplane model in wind tunnel shows what might happen to sky liner without proper de-icing equipment

To help aviation overcome the hazard of ice conditions, engineers in an Akron laboratory reproduce those conditions in a wind tunnel. Temperature in the tunnel is reduced to eight degrees below zero and fans send an eighty-mile wind against airplane parts. The immediate result is the formation of the beautiful but dangerous ice sheaths, but the ultimate result is development of de-icing apparatus.

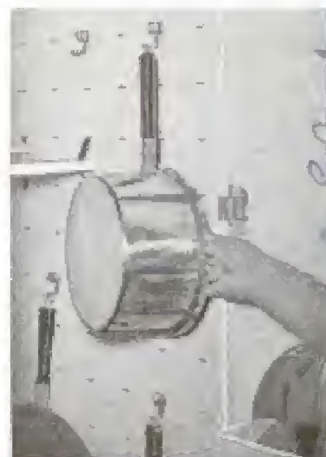
### Relief Map Made from Plane by Stereoscopic Photos

Army photographers are experimenting with a stereoscopic method of making relief maps from the sky. Instead of the traditional system of snapping two pictures simultaneously with lenses as far apart as your eyes, the air corps camera snaps a single photograph, then, a second later, snaps another. The resulting pictures,

viewed through a stereoscope, show the ground in relief. This method promises to be of value to an army studying unknown terrain during military tactics.

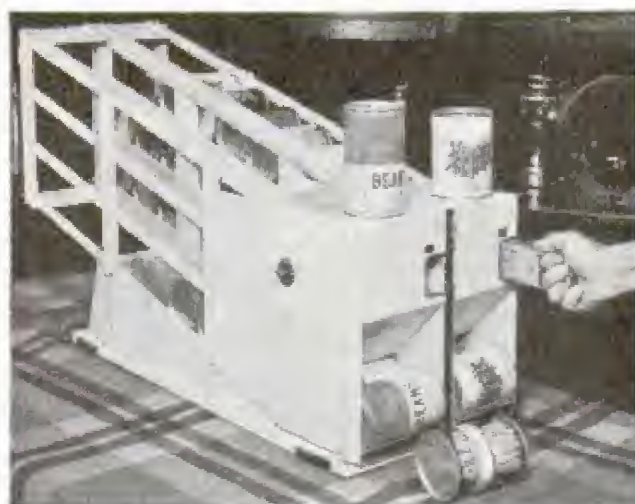
### Slots in Steel Kitchen Cabinet Support Utensil Hooks

Pots and pans can be hung on the inside wall of a steel kitchen cabinet being shown this fall. The inside wall of the cabinet is lined with rows of narrow slots which serve a dual purpose. Shelf supports made of flat, springy metal snap into the slots, or they will hold spring wire hooks from which utensils may be hung.



### Self-Service Grocery Vendor Tallies Cost of Purchases

Built like sectional bookcases, a mechanical vendor for self-service grocery stores delivers the food parcel to the customer at the insertion of a small register in a slot, and the register keeps a tally of the cost of each purchase. Only a cashier will be seen in a store equipped with these vendors. Clerks, in the background, keep the bins of the white enameled vending units filled with merchandise.



Model of self-service bin shows customer receiving  
can as he inserts register in slot

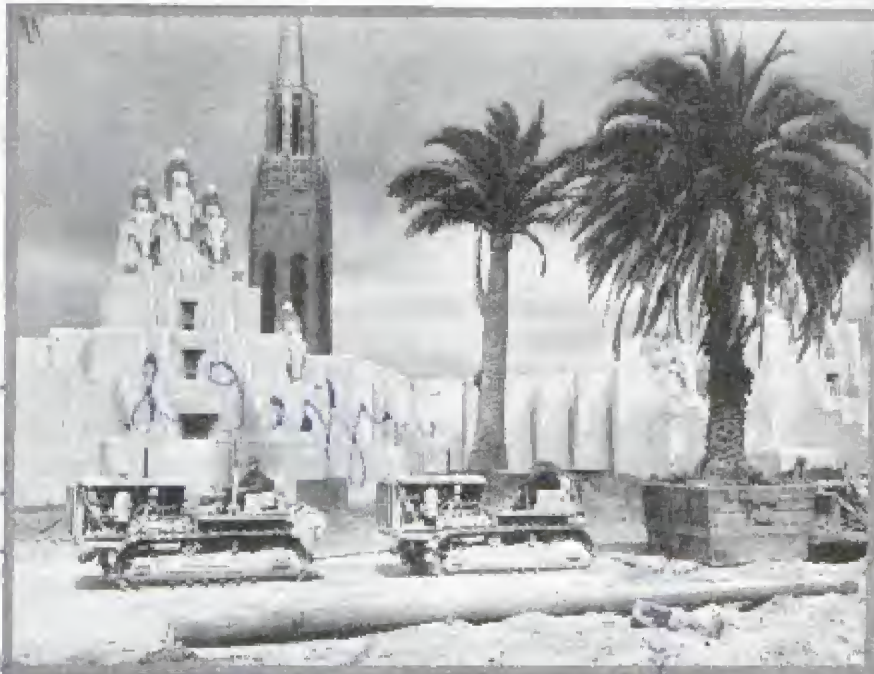


H8Y 4

Caterpillar tractor

# Tractor Transplants a Forest of Palm Trees

Treasure Island, site of the Golden Gate exposition in 1939, needed a grove of full-grown palm trees. Transplanting a forest of palms—3,200 of them, from ten to sixty-five feet high and weighing as much as thirty-eight tons—calls for plenty of power. Some required two ninety-five horsepower tractors to pull while a third pushed.



Above, a big palm tree is winched down ramp into hole. Left, two tractors haul while a third bulldozes a boxed tree to new location on avenue of Golden Gate exposition. In less than thirty minutes a tree can be unloaded from barge, moved into place and planted

H8P6

## Rigid Sun Awning for Automobile Fits over Top of Door

Adjustable and almost indestructible, a new rigid sun awning for the automobile or truck fits over the top of the door. The shield is pressed of light fiber wood and is reinforced by strap iron riveted along both ends and along the inside edge. The reinforcing straps extend to form a hinge that holds the adjustable clip which fits over the door top. The hinge allows the awning to be raised or lowered. If the car is locked, the awning cannot be stolen since the door must be open for removal.



Automobile door with sun shield attached to its top. The shield is rigid

Outdoor advertising signs along country highways in Denmark are prohibited by a law which recently went into effect.

Leak of Comm. memo 1/26/38

Handwritten notes on the right margin, including 'Lumber Bank - Quinsigamond Co. - 1/11/38'.



## Grasshopper Trap on Car Made of Old Hog Trough



Bangboard with trough full of crankcase oil at its base collects grasshoppers nightly on Nebraska farm

To harvest the grasshoppers before they harvest his grain, a Nebraska farmer has built an insect trap of an old hog trough mounted on the front of his car. Every night he drives over a field, with a spotlight on the front to attract the hoppers, and in a single week he collected 990 pounds of dead grasshoppers from a five-acre field. Counting a sample, he estimated the week's catch at 792,000 of the pests. The hog trough, ten feet long, ten inches wide and six inches deep, was fastened to the frame of the car with two-by-fours and a piece of old signboard tin thirty inches high was used as a bangboard. Five gallons of water and two quarts of old crankcase oil were used as a lethal solution in the trough, and baffles made of auto licenses kept it from splashing out.

## Aluminum Cup Forecasts Heat by Testing Sky Radiation

Forecasts of temperature fluctuations are being made with a new "weather prophet" consisting of a thermometer in a cuplike aluminum reflector. Prof. Charles M. Heck

of North Carolina State College, the inventor, theorizes that heat rays rising from the earth are absorbed by atmospheric moisture and then reradiated, and by pointing his instrument at the sky he can find the reradiation center. By discovering this center, he believes it will be possible to predict the lowest temperature on the earth overnight, since the earth cannot become colder than the reradiation point without an outside disturbance. The aluminum mirror is insulated from ground temperatures by four larger reflectors.

## House Meters on Street Posts Save Utility Company Money

House electric meters are mounted on street posts instead of within the customer's home by a North Carolina public utility company. This practice resulted in three notable savings for the company. Meter men can take their readings without leaving their automobiles; second visits because of the absence of the householder are never necessary, and illegal "bridging" of meters by the electricity user is eliminated.



Electric meters set on post at curb can be read from car and agent need not enter customer's home

Westinghouse

Ethel Field, near Lincoln

Cm. W. G. Stewart

H. A. Raleigh, N.C.

Electric meter Co. E. Pittsburgh Pa.

new York Times  
8/16/08



# "No Limit" to Fishing with a Barbless Hook

There's a fisherman's paradise near Bellefonte, Pa., where you can cast all day in a stream teeming with trout and catch all you like—but you can keep only two. So barbless hooks are the rule. State wardens have provided ideal conditions for trout in this Spring Creek project, with dams and natural pools. The stream is heavily stocked. The barbless hook is required because the fish can be



Fishing with barbless hooks in trout paradise near Bellefonte, Pa. Lower picture is an aerial view of project. The stream is heavily stocked

shaken back into the water without being handled. Fish have a protective mucus covering which is easily damaged by the touch of a dry hand; once this is done, fungi can attack where the coating was disturbed and the fish will probably die later even if it is thrown back into the water instantly.

## Flying Greenhouse Is All Eyes for Army Reconnoitering

People who live in glass houses today are the army air observers. The latest observation plane, tried out in autumn maneuvers, is virtually a flying greenhouse, its long cockpit roofed over with transparent panes for the maximum visibility. A mid-wing type, it has an 850-horsepower motor and retractable wheels.

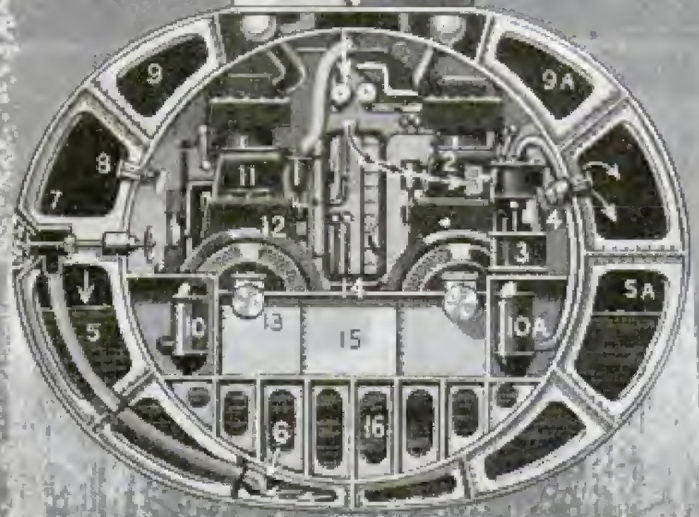
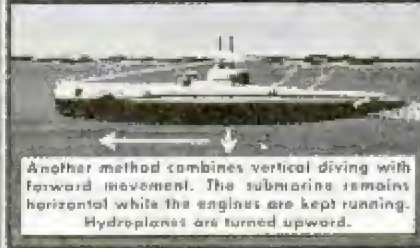
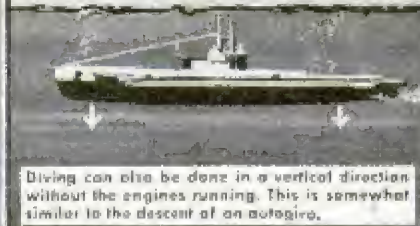
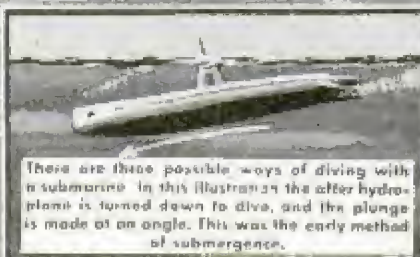
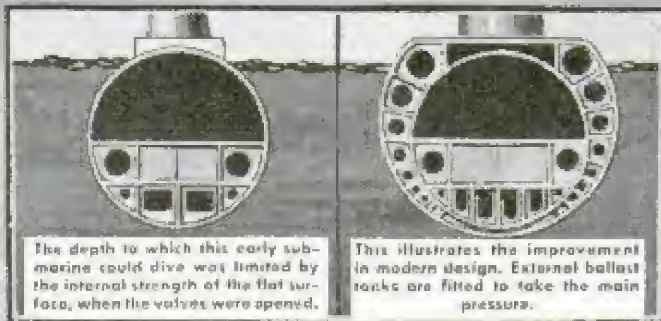


Cockpit of this army observation plane is completely glassed over to give its crew the maximum visibility while flying over enemy lines

North American Aircraft Corp.  
Inglewood, Calif.



# Mine-Laying Submarine Latest in War Craft



This sketch shows how a modern submarine returns to the surface:

1. The submarine breaking the surface with the conning tower hatch opened to admit pumping outside air.
2. Air inlet.
3. Air pump forcing air into the tanks without using compressed air bottles.
4. Three-way blowing valve.
- 5, 5A. Air forcing water out of external ballast tanks.
6. Water tail-pipe.
7. Flooding valves open for ejecting water.

8. Air vent valve to relieve pressure in tanks when emptied.
- 9, 9A. Special anti-ralling tanks.
- 10, 10A. Compressed air bottles. Used only for blowing the tanks sufficiently to raise conning tower above the waves.
11. Diesel engines.
12. Main electric motors. Used also for driving auxiliary motors for pumps.
13. Propeller shaft.
14. Watertight door closed.
15. Battery tank.
16. Internal ballast tanks used for maintaining positive buoyancy.

British submarine laying mines. Cutaway shows how the mines are released

Wonders of the modern submarine were revealed recently as a feature of Navy Week in England. Among the underwater craft on exhibition was the "Porpoise"

class, the latest and only mine-laying submarines in the British navy. These craft are 271 feet long, weigh 1,520 tons on the surface and 2,140 tons submerged, thus



using 620 tons of water for submerging. They carry a crew of fifty-five. Armament includes one four-inch gun, two machine guns, mines and six twenty-one inch torpedo tubes. Their 3,300-horsepower Diesel engines give a surface speed of seventeen knots and their 1,630-horsepower electric motors an underwater speed of slightly less than nine knots. At its job of mine-laying, the submarine expels the explosives, the mines traveling along rails and being released through special trapdoors at the stern. The mine-laying submarine is very useful for blocking harbors without the knowledge of the enemy in time of war. In the modern submarine, the method of breaking the surface is to blow sufficient compressed air into the main ballast tanks to raise the conning tower above the water. The hatch is then opened and fresh air is drawn in by the pumps. This method saves the space which otherwise would be necessary for storing compressed-air bottles. The saving is considerable, since some submarines must eject several hundred tons of water ballast in ascending.

## Cairn Marks Halfway Point Between Equator and Pole



Every county in Michigan contributed a stone to this cairn near Traverse City marking midpoint between pole and equator

Beside a road in northern Michigan is a cairn marking the halfway point between the Equator and the North Pole. Prominent citizens erected the cairn, which is a few miles north of Traverse City. In it are stones from every county in the state.

## "Slide-Rule" Exposure Meter for Movie or Still Pictures



Sighting object through density strip at lower left, photographer takes reading when view is obscured

Exposure time and aperture for taking either motion or still pictures can be gauged readily with a vest-pocket exposure meter of the density-strip type. The photographer sights his object through a sliding strip which becomes progressively darker until the scene is obliterated. As it fades from view, the reading is taken and the proper exposure found in the column corresponding to the film emulsion speed being used. One side is marked for movies, the other for stills. The strip is also calibrated to show foot-candles. Such a meter is inexpensive and has no parts subject to wear or maladjustment.

☛Inquiries as to makers of articles described in Popular Mechanics will be answered by our Bureau of Information upon receipt of return postage.

Ashenthurst Photo Meters Co.  
105 N. La Salle, Chicago

From Chevrolet Motor Div. Sales



Carl Thomas & Stinson Jr.  
10555 Holman Ave.  
Los Angeles, Calif.

# KEEPING ZOO

Model of monkey apartment house. Below, high tower with projecting steps and runways for mountain goats and sheep



WHAT'S the secret of gathering thousands of wild animals from every corner of the globe and getting them to live happy and contented lives in the same zoo?

Polar bears fresh from the Arctic, babirusas and gorillas from the jungle, grizzlies from the mountains and rare fennec foxes from the barren Sahara all live in different climates, eat different foods and have different habits,



yet they can be made to thrive in the same menagerie.

In the past a zoo had to replenish its exhibits with new specimens continually because it seemed that animals moved far from their homes would not remain happy and healthy. Tropical animals caught cold and died during the winters and animals from the frigid zones succumbed during hot summer days. Cramped cages broke the hearts of animals accustomed to roaming for food.

But today in San Diego 3,000 animals gathered from every continent and climate are leading happy normal lives. More than 600 different species, ranging from tiny birds and snakes to gorillas and elephants, are living in the 200-acre park of the Zoological Gardens of San Diego. Rare animals that never before lived long or bred in captivity are flourishing as if they were still in their native surroundings.

Mrs. Belle Benchley, under whose management the zoo has grown to be the second largest in the United States, explains that mere food and shelter are not enough to keep any wild animal in good health. Discontent from the wrong surroundings



# ANIMALS HAPPY

alone may cause ill health. Putting a small tree in a bird cage may make all the difference in the world if the birds seem dopey and despondent. Mrs. Benchley and her staff try to provide each species with quarters that seem natural and comfortable. Buffalo and deer have long ranges in which to graze, the tapir and the hippopot-



*Galapagos iguana being fed banana. Below, Malay sun bear clambering around artificial concrete tree built in its enclosure to encourage exercise*

amus have pools in which to wallow, and most of the birds are placed in cages large enough for reasonably long flights.

One of the prize exhibits consists of two giant mountain gorillas, now about twelve years old, that have flourished since they were delivered to the zoo by Martin Johnson in 1931. No gorilla has ever been born in captivity so Mrs. Benchley has to estimate their age by the fact that Ngagi, who now weighs 460 pounds, had just lost his baby teeth when he joined the zoo. That was seven years ago and as far as is known gorillas lose their baby teeth when about five years of age. His companion Mbongo, who weighed 120 pounds at the time of arrival and who has doubled in weight, lost his baby teeth a few months after arrival. Gorillas used to be one of the most difficult of all animals to keep alive in captivity, principally, Mrs. Benchley de-







clares, because their keepers insisted on treating them either like backward children or vicious humans instead of the wild animals that they are.

"Keeping animals contented depends upon helping them feel secure and at home," Mrs. Benchley says. "They obtain a sense of security from the back wall in each cage or exhibition space that keeps them from worrying about being attacked from the rear. Animals appreciate privacy, too, and enjoy enclosed spaces or caves in which they can eat and sleep in peace. We never handle an animal unless it is necessary because the excitement and fear that is aroused is apt to sicken it for days. All animals need sufficient room and an induce-

ment to exercise if they are to remain healthy.

"Animals enjoy the company of their own kind and we try to raise each species in family groups. Some animals such as deer sometimes live in even larger groups and we let such animals run in herds.

"Of course, that sometimes means that there will be fights and that some of the animals will be injured but we have found that they remain happier if we let them work out their own self-government. There is usually one leader or bully in each cage of monkeys. We have to throw food into different parts of the monkey cage at one time to keep such a bully from getting it all."



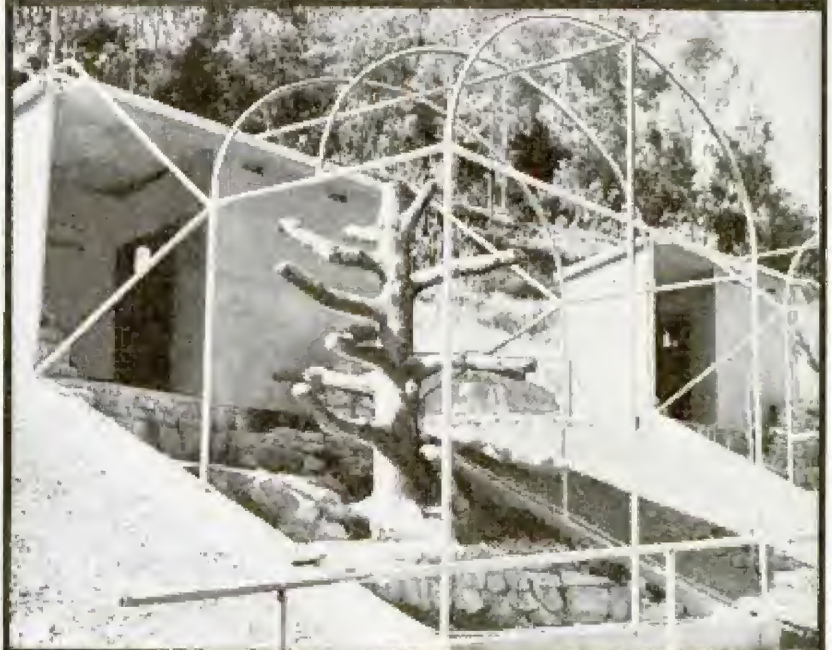
*Top, left, young orangutan. Right, lions sunning on log in zoo. Bottom, left, bear grotto containing pool and caves. Right, giant bird cage containing full-size trees*



For the first month after a new animal arrives at the zoo, fresh from its native jungles or mountains, it lives in a special quarantine station. This is mainly so that its reaction to different foods can be noted and the right diet worked out for it. Animals from the tropics arrive during May so that for the next few months they will have the benefit of high summer temperatures. Similarly, late in September is the best arrival time for animals from the north and far south. Acclimatizing the animals requires about a year as they must adjust themselves to changes in climate and diet as well as become accustomed to the captive state. Strangely enough, Arctic animals such as polar bears and fur seals adjust themselves to the temperate climate of San Diego more easily than do apes and other animals from the tropics. Many tropical animals live in heated quarters during their first winter at the zoo.

Diet, more than anything else, adjusts an animal to its new climate. Different zoos have tried refrigerated pools, frigid rooms, and steaming tropical cages for some of their rare exhibits without much luck. The right diet does the trick much better. Animals and birds from the tropics are given more fat than they generally eat so that they can endure the colder winters, and animals from the frigid zones receive more greens and less fat.

Practically every known kind of food from milk and eggs to squab and rabbits, as well as all kinds of hay and grain make up the menagerie's menu. The meat eat-



Top, elephant at edge of boundary pit. Center, den being built for leopard. Bottom, bird life at Brookfield zoo, Chicago

(Continued to page 130A)



## Berlin-New York Round Trip Takes Less Than Two Days



*Twenty-four-passenger German liner which made first westward air trip from Berlin to New York, then turned back to make it first round trip*

Forty-four hours and forty-six minutes from Berlin to New York and back again. Eight thousand miles over land and ocean in a four-motored land plane. That was the record written into the aviation books by the German air liner "Brandenburg" which, with its crew of four, made the first westward crossing of the Atlantic nonstop from the German capital to New York and then turned around to beat the previous record for the eastbound trip. Capt. Alfred Henke had figured on a twenty-hour eastward flight. He beat his schedule by five minutes, averaging 207 miles an hour. His westbound time had been twenty-four hours fifty-one minutes. The plane is a commercial type with a capacity for twenty-four passengers, and its quartet of 850-horsepower engines are of American type, built in Germany under license by an American firm. The plane weighs nineteen tons. Three hours' fuel supply remained when the ship landed on this side, and of 2,580 gallons of gasoline taken on at New York there remained ninety-two gallons when the return trip ended.

## Wast Canyons Found in Ocean by "Echo" Recorder

Chasms deeper than the Grand Canyon of the Colorado have been discovered in the bed of the ocean by the sonic depth finder. One of these submarine canyons, perhaps cut by a prehistoric river that flowed down the ancient continental slope,

lies off the coast of California and is seventy miles long and from 6,000 to 8,000 feet beneath the "plateau" of the sea floor. Another, the Chotsui Pii canyon near the Philippines, is 9,600 feet deep. These abysses can be accurately measured by the sonic depth finder, which listens to the "echo" of sound reflected from the ocean bed and translates time into distance.

## Funnel on Stilts Fills Barrel Without Up-Ending It

Specially devised for filling barrels without up-ending them, a funnel with horizontal spout opening is held in place on the barrel end by props. A welded lug on the spout hooks inside the barrel, preventing the funnel from pulling out accidentally.



*Its spout extending horizontally into end of barrel, this funnel is propped up by a special bracket*

*The Kaylor  
Co. Pat. 2,116,000*



H 807

POPULAR MECHANICS

705

Danile La Lee

Culver City Calif

## Flier Designs Streamline "Push Button" Car

Borrowing ideas from the transport planes he has piloted, a California airman designed and built a streamline automobile with a rudderlike tail. With its supercharged V-eight motor he asserts that the car will travel 120 miles an hour, yet it is economical in fuel use, delivering eighteen miles to the gallon at sixty miles an hour. Wind resistance is reduced to a minimum, even on the front wheels which have independent "pants" that turn with the



At touch of button on dashboard, the folding top disappears much as retractable landing gear of a plane vanishes into wing. At left may be seen the rudderlike tail, and below, the "pants" which turn with the front wheels



wheel. Electric controls are built in wherever possible. A push button on the dash opens the doors. The disappearing top swings into place at the touch of another button, embodying the same mechanism applied to raising and lowering landing gear in an airplane. When the top is raised it forms a strong steel turret roof. The car has a 112-inch wheelbase. Built low, the car has no running boards. The headlights retract into the fenders.

## Volcanic Eruption Is Blamed for Poison Element in Soil

Volcanic eruptions in the remote geological past are to blame for the presence in the soil of selenium, the poisonous element which has made inroads into western livestock and is the cause of certain rheumatic symptoms in man. Department of Agriculture scientists who have been studying selenium poisoning say no soil is quite free from that element, but most dangerous selenium content in this coun-

try is found in the Great Plains. They believe the selenium was belched into the air by volcanoes, then washed to earth by rains and formed clays which were buried and became shale. Later the shale beds were exposed and weathered into soil. Certain plants absorb selenium more than others, and livestock are poisoned when they eat these, notably two members of the pea family, a loco weed and a vetch.

Technical Bulletin #601

Selenium Service 7/25/38





Streamlining begins in front of the propeller. At left, an engineer is measuring smoothness of propeller spinner to be fitted to a racing plane; it must be perfectly balanced for top speed performance. Below, the "Eight Ball," one of the newest racing planes. Notice its slim body and the narrow space allotted to engine

# The SECRETS of



THE fastest airplane in the world today is an old-fashioned antique. It is an Italian seaplane that cost more than \$1,000,000 and set an official record of 440 miles per hour. That was four years ago and the record still stands.

Today we can break that record any time we like at only a fraction of the

By KEITH RIDER

Race Plane Designer

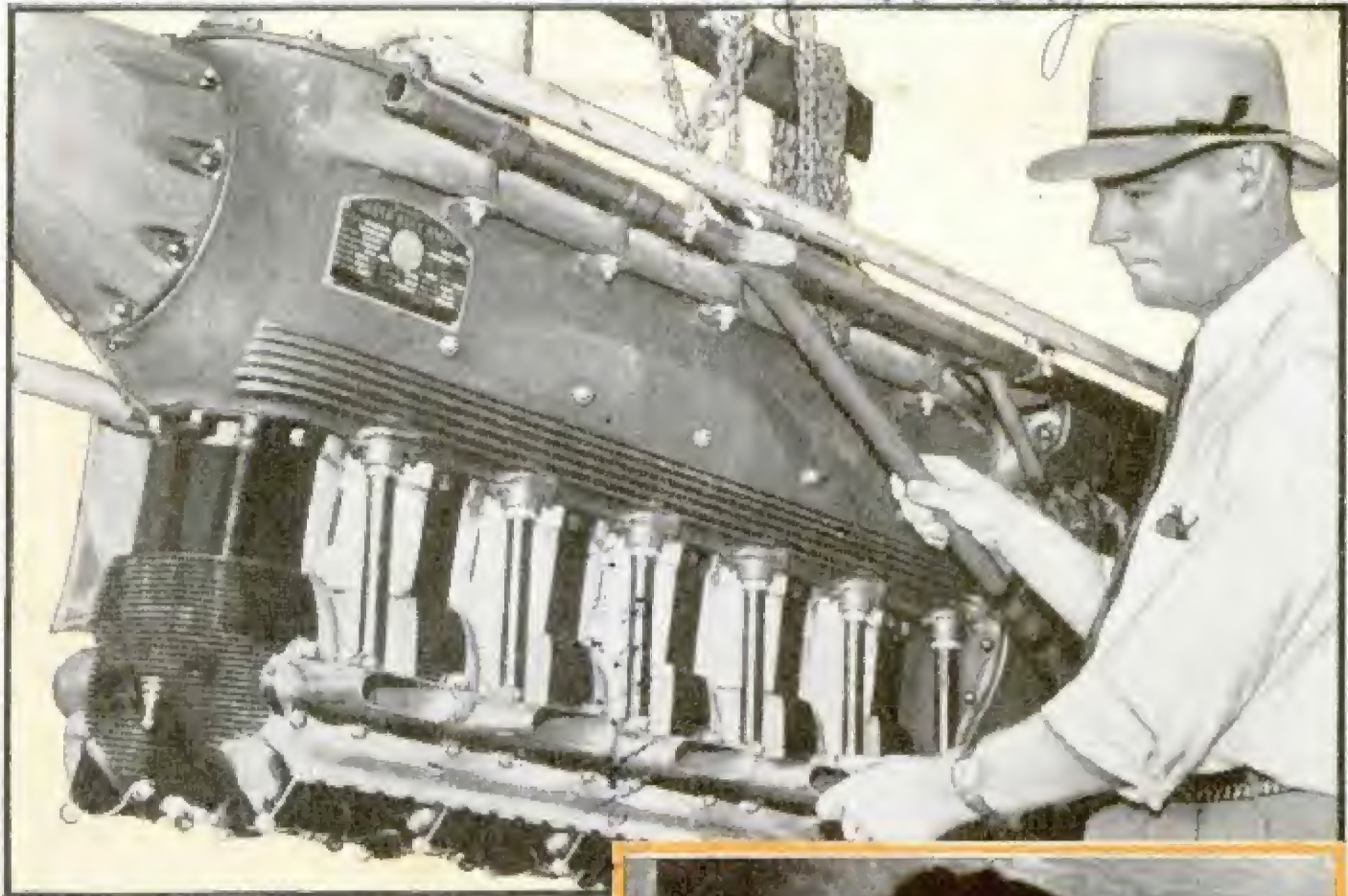
cost. World records can be bought at bargain prices this year compared with the tremendous sums that have been spent in the past. A 500-miles-per-hour plane now might cost a mere \$60,000.

The price of speed has been going down because our knowledge of speed has increased. More is known now about airfoil



Cent. Thomas & Stinson Jr.  
18555 Holman Ave  
Los Angeles, Calif

H 764



## SPEED . . .

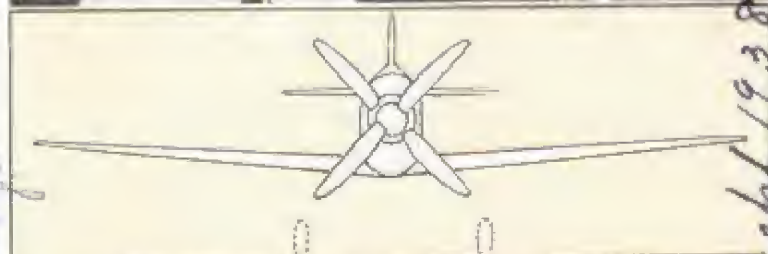
shapes and engines. The Italians used a special 3,000 horsepower Fiat in their seaplane but with our present knowledge we could make a 1,500-horsepower engine go faster. This because we have learned to obtain high speed by designing more efficient airplane shapes.

The story of speed is written thus: horsepower multiplied by 375 and divided by resistance in pounds equals miles per hour. The figure 375 is a conversion factor. That's the same as saying the more power and the less drag, the faster you go. The frontal area of the engine is the biggest contributing factor to drag, hence in-line engines are "faster" than radials of the same horsepower. Another speed problem is to get the most horsepower out of the lightest engine weight. A light engine requires less wing and a small wing



The author, top, with six-cylinder racing engine rated at 260 horsepower from which 475 horsepower is developed by making changes. Bottom, adjusting hot wire anemometer to measure air flow speed around model plane parts in wind tunnel





Front view of 500 m.p.h. racer showing streamlined wing fuselage



Top, inspecting tail group controls of the "Eight Ball." Bottom, a speedy racer, the "Jeep." Diagrams show top and front views of racer theoretically capable of 500 miles per hour

helps reduce drag. In theory it would be feasible to fly a high-speed wingless airplane consisting simply of engine, fuselage, and tail group if there were some way of launching, landing and obtaining lateral control.

Here's a description of a super-plane that could go 500 miles per hour. No matter where it is built or what minor details are changed, it will follow these major specifications pretty closely.

The plane will be a full cantilever low-wing monoplane resembling present race

planes in design. It will be built of wood, full monocoque molded plywood 100 per cent skin stressed. The fuselage and wing skins will be about three-quarters of an inch thick. Wood is better than metal for speed designs because we can shape wood to hold the exact air-foil curves needed.

The wing would have a span of twenty-six feet and the plane would be twenty-three feet long. It would be a land plane, with long flaps to help cut down landing speed, and retractable landing gear. The plane would be entirely enclosed with only a cockpit air scoop and carburetor air scoop opening into the wind. It would land at about seventy-five miles per hour.

The engine would be of 1,500 horsepower, liquid cooled, twenty-four inches by twenty-four inches in cross section and about five feet long. It would probably consist of two V-8 units hooked back to back and driving two propellers, one in front of the other and turning in the opposite direction. Such two-way propellers are necessary to overcome engine torque and give good control. The engine-cooling solution would be cooled by means of skin radiators, as would the oil supply. The power plant would weigh about 800 pounds, developing close to two horsepower per pound, and would have a useful life of only a few hours at open-

Art Chestnut's  
Jeep

na 8 sep 1938 3 77



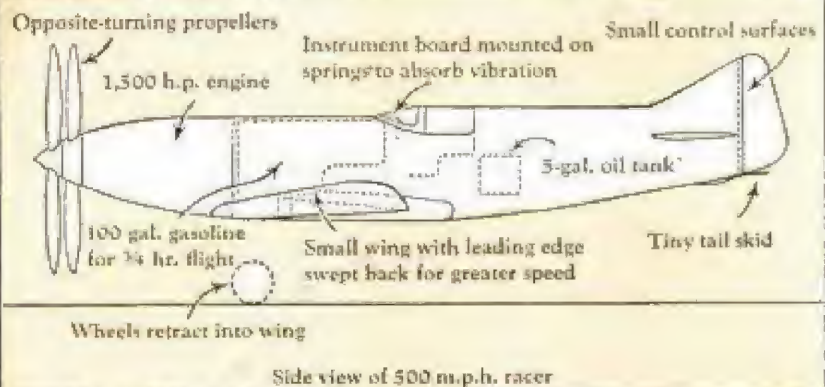


Completing race plane wing, top. Side view of plane which might make 500 miles an hour or more and, bottom, small tail surfaces of modern racing plane

throttle. Ready to fly, the plane would weigh about 2,800 pounds. About half its total cost would be for developing and testing the engine.

There is nothing radical about such a plane. Construction could be started any time because nothing really new need be developed. Every part of the design has been tested. The exact top speed would depend primarily upon horsepower and a more powerful engine would make the plane faster still.

Lack of horsepower has been the big drawback to higher racing speeds in the United States. Our best in-line racing engine today, even when "hopped up" as much as the pilot dares, still develops less than 500 horsepower. With such engines pilots expect speeds of better than 300 miles per hour in straightaway dashes. That is quite an advance over anything done so far but hardly comparing with speeds we will make next year if the bigger racing engines



that are being discussed become available.

One of these possibilities is a new "unitwin" Menasco consisting of two six-cylinder, in-line, air-cooled engines placed side by side and geared together through clutches to turn a common propeller shaft.

(Continued to page 124A)



## "Foot Race" on the Water in Pontooned Pedal Boats



Here is a seagull's eye view of the twin-pontoon boat. The crew that wins a race in this craft needs sturdy legs for pedaling

"Foot races" on the water were a popular sport among guests at the Atlantic shore resorts during the summer. The racers pedaled in teams of two, riding in two-passenger pontooned pedal boats that skim lightly on the surface of the water.

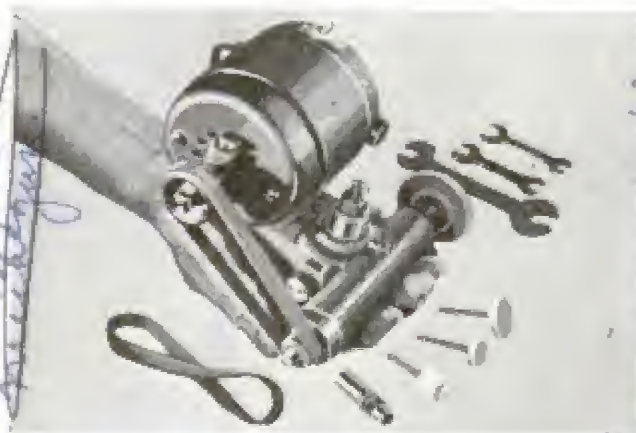
warding, if necessary answering personal mail. She supervises moving, directs housecleaning, recatalogues libraries and mailing lists and helps dispose of household effects. On one occasion a client wanted a charity appeal investigated; there was the problem of keeping a one-armed man with a wife and five children from going on relief. She investigated the family, found a farm, attended farm auctions and stocked it with horses and cattle, bought clothing for the family of seven and transplanted them to the farm which she had leased for her client. Now a regular part of the business of "Why Bother" is inquiring into charity appeals. Operating with no other staff than an occasional telephone secretary, the director refuses to be stumped by any demand: either she does the job herself or takes the responsibility and calls in expert movers, decorators, speech-writers, etc. One popular service is reading aloud to clients.

## Small Shop Lathe Grinder Fits in One Hand

Small enough to fit easily into your hand is a lathe grinder built for the home and small workshop, and useful, too, for odd jobs in larger plants. It is driven by a one-sixteenth horsepower motor. The dynamically balanced motor has two speeds, 6,000 and 19,000 revolutions per minute.

## "Why Bother" Offers First-Aid in Any Task You Name

If there's any job that appalls you—moving day, a research problem involving weeks of reading, a wedding in the family or a party that must run smoothly—"Why Bother?" There is an agency by that name in Chicago that will take the responsibility for you. Its director, a woman, makes her living by accepting any task that is assigned. She goes shopping for people who are too busy or dislike shopping. She performs secretarial work, sorting, for-



Belt-driven lathe grinder and its one-sixteenth horsepower motor rests in the palm of one hand

68 E Cedar

H 919

Mrs. E. L. Peppel  
1000 Taylor

Alumare Co.  
- 52-16 St. St.

Providence, W. Va.



# Army's Mobile Sound Unit Heard a Mile Away



One window in side of army sound truck is high-fidelity loudspeaker. When officer addresses troops over mile range, towers with big loud-speaker horns are erected. Notice power outlets in truck wall, above

built-in loudspeakers and collapsible steel towers for public addresses over a wide area. The two permanent speakers are in the side walls of the truck, providing high-fidelity reproduction over a relatively small range—for audiences of 5,000 or less. These are the latest improved theater-type units. When the commander wishes to address an audience as large as 100,000, the two twenty-foot steel towers are taken from the rear storage compartment and set up on the field, carrying at their tops six 100-watt loudspeakers driven by six fifty-watt amplifiers. They are built to withstand a forty-mile wind, and can be weighted with sandbags if high winds are encountered. Three men can erect these external speakers, which are of slightly lower fidelity, within an hour. In a test at Fort Myer, Va., orders issued over these powerful speakers were heard clearly a mile away. A five-foot fishpole mast is raised over the truck when the radio is in use; two types of turntables for transcription and recording and three types of microphones are carried.

If the regular army of the United States could be assembled in an area within a mile of the army's new mobile sound truck, the chief of staff could address its entire personnel over the powerful loudspeakers of that unit. Self-contained, the truck has its own gasoline-driven power plant of three kilovolt-amperes, two-way radio for telephonic communication with distant troops or planes overhead, permanent

Cont: John L. Coontz, c/o Stevens, 3901-5th St. N. Arlington, Va.



# Road Grader Has Bridge to Let Trucks Pass



Trucks delivering gravel and cement to concrete-laying crew at rear do not interrupt this road grader. Although it spans entire road, riding side forms for a track, trucks pass over it on spring-mounted ramps

Using the side forms along the new highway for a track, a subgrader working on Nebraska roads travels along ahead of the mixing machine and does the work of a troop of twenty-five pick and shovel men. It loses no time pausing to make way for passing materials trucks, for the machine has an overhead passing "bridge" attached to it by strong coil springs, and loaded

trucks can drive over it without interrupting the grading work. A cutting cylinder fitted on a long shaft extends from end to end of the grader. Small cutting teeth are fitted in the outside face of the cylinder and may be set to any depth to suit the contour of the grade. A pan holds the pulverized dirt, and chain conveyors carry it to the ends and dump it on the shoulder.

## Light Fixtures Made of Plastics Molded in One Piece



Artistic light fixture above is molded from plastic

Lighting fixtures molded in one piece from non-conducting plastics are being introduced. Instead of manufacturing and assembling numerous parts—the metallic chassis that must be punched and finished by plating, the sockets made of multiple plastic and metal parts held in place by screws, etc.—the plastic manufacturer molds the cavities for the electrical parts as an integral part of the fixture. This achieves considerable saving in manufacturing costs, and the product is artistic, sturdy and safe from electric shock.

## Endless Chain Hauls Trucks at Parcel-Sorting Depot

Borrowing an idea from the assembly line of automobile manufacturing plants, the Railway Express Agency has installed an endless line of platform trucks, hauled by a continuous overhead chain, for sort-



ing parcels at its New York terminal. Pick-up vehicles line up on one side of a ninety-eight foot platform and the packages are unloaded directly to the moving line of double-deck transfer trucks. As these trucks parade around the platform they are unloaded as they pass the trucks waiting on the opposite side for packages destined for various railroad stations. The system has handled as many as 12,500 packages an hour.

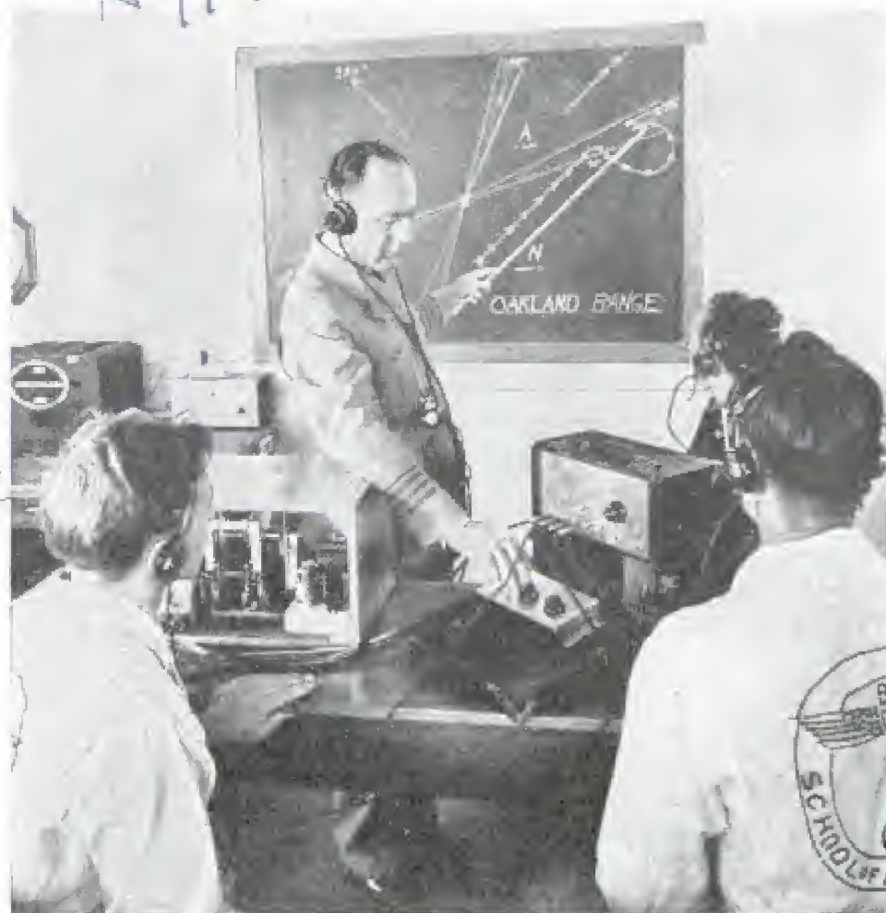
## Four Gas Engines Drive Model of Clipper Ship

Four miniature gasoline engines power a model flying boat patterned after the clipper ships that fly the Pacific between California and the Orient. A miniature compared with those giant trans-oceanic planes, the model is pretty big, itself, with a wing spread of 150 inches. It weighs thirteen pounds. The engines are equipped with timers to cut them off at any time within five minutes.



Four slots in leading edge of wing show where engines of this clipper model are mounted. The flying boat has a 150-inch wing spread

## Radio Range Demonstrator Teaches Aeronautics Class



Students in aeronautical school listen to dot-dash of aural radio range demonstrator as instructor varies signals with manual controls

Operation of the aural radio range is taught to student pilots by means of a demonstrating unit which reproduces the signals on loudspeaker or headphones while the instructor gives a graphic lesson on the blackboard. One part of the unit contains an alternating-current power supply, audio oscillator and a small motor driving two cams on a single shaft at a speed of one and one-half revolutions per minute.

One cam has twelve "A" (dot-dash) code signals and the airport signal, such as OA for Oakland; the other cam has twelve "N" (dash-dot) signals and the station signal. The cam signals are amplified and can be varied by manual controls.

There were 7,822,000,000 fish and eggs produced in government hatcheries in the year ended last June 30.

Bryll by Elwood Chandler Hollywood Calif

Sept. of Commerce Memo 7/29/38



# Pearl Farmers Plant and Harvest a Rich Crop



*Top, Japanese diving girls with glass masks gather oysters. Left, planting irritating particles in oyster. Below, harvesting a pearl. Center, \$10,000 collection of pearls*



There's no quick harvest on a pearl farm. It takes years to grow a pearl. But when the crop is "ripe," it is a rich one! The \$10,000 handful of pearls pictured above represent sixty years of research and ten years of actual work by the oysters and the men and women employed on a Japanese pearl farm. "Planting" pearls re-

quires surgical skill. First the Japanese diving girls go down to the floor of a bay and bring up oysters, filling floating tubs which are emptied into a collection boat. The girls average 300 oysters a day. In a laboratory ashore, experts using surgical knives and tweezers carefully open the oyster and insert a tiny irritating fragment of freshwater mussel, then disinfect and sew the wound and return the oyster to the sea floor. The oyster secretes mucus, depositing it layer on layer around the foreign substance within its body until the protective film develops into a pearl. Eventually the oyster is recaptured and opened and the pearl harvested. Oysters can't be forced to manufacture pearls to specifications; they vary in size, they are not all perfectly spherical, some lack weight and color. Only the perfect specimens are kept.

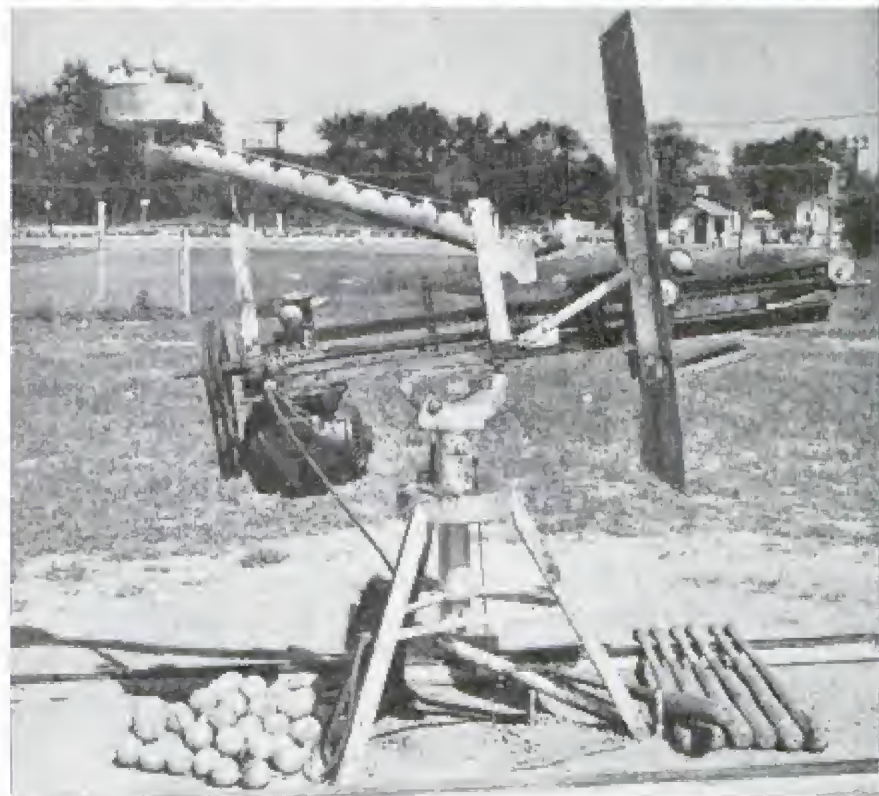
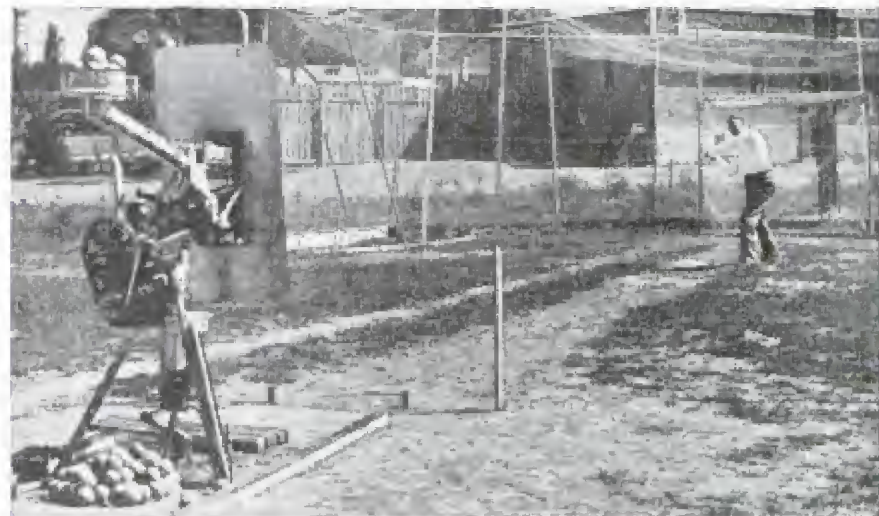
*see Feb. 1941 - 348*

*Michimoto.*



# Machine Gun Subs for Pitcher in Batting Drill

Flinging baseballs across the plate of a St. Louis "sandlot" with the speed of a crack pitcher and better than human accuracy is a mechanical hurler. It started out as a substitute pitcher for batting practice, and it may develop into a pastime for amusement parks and roadside "diamonds." The inventor had watched his son in baseball drill at Harvard. Only about one-third of the balls served up by pitchers in batting practice were suitable for hitting. He went back to St. Louis to build something "like a bean shooter or slingshot that would get the ball over the plate nine times out of ten and give the batters a chance." The machine shoots baseballs at four a minute at any speed desired; they cross the plate within a one-foot space, the height of the pitch being adjustable. A two-horsepower motor operates the robot. Balls drop from a hopper into a grip, and a large rubber band, a foot in diameter, provides the punch that flings the ball. A small bell warns the batter just before the pitch. If the batsman is weak in some department, such as low or inside balls, the robot can be set to pitch in that groove steadily. It can also be turned toward the outfield or infield to shower the fielders with flies and grounders. It will flip a fly ball 500 feet—a homer in any



Top, mechanical pitcher sends one down the groove to batter. Below, side view showing how balls are fed from hopper to powerful rubber sling

league. Although designed as a training machine for batters, the original machine is set up in a "diamond" with oil-painted "fielders" and with nets across infield areas usually guarded by players. Balls batted past the nets are credited as base hits.

## Tiny Radio Transmitter in Whale Harpoon Helps Locate the Catch

Losses of whales under conditions of poor visibility may be reduced by the mounting of a tiny radio transmitter in the upper end of the flag harpoon used to mark the posi-

tion of a dead whale. The transmitter automatically radiates a signal which enables the whaling ship to locate the dead whale by means of direction-finding apparatus.

Used by Norwegian whaling expedition  
repacked to transportable fliv.  
Leif. & Connors 8/18/58

A. F. Howl, 6527 Manchester Ave. St. Louis, Mo.

H 952

14 100 3.

Press memo - Leif & Connors 8/18/58



## Rumble Seat on Handle Bar for Cyclist's Baby



Seat built on handle bars has top for protection  
of the baby in bad weather

When one proud father in Switzerland wants to take the baby for an airing, he fits a special rumble seat on the handle bar of his bicycle and away they go. The seat is equipped with a top to protect baby from sun or shower, but the top can be folded when desired.

## Fluoride Water Guards Teeth, Study of Decay Indicates

Drinking water containing fluoride, a worry in certain localities because it causes a discoloration of the teeth of children, known as mottled teeth, may be a blessing in disguise. A four-year study has revealed that children drinking this water are relatively immune to tooth decay. Examination of thousands of school children in South Dakota, Colorado and Wisconsin showed that the severity of dental caries is lower in localities where the mottled enamel occurs. In counties where the mottled enamel is generally prevalent, 1,902 children were found to have only 201 per-

manent teeth affected by decay to each 100 children. In another group of counties, and the cities of Huron and Sioux Falls, where no mottled enamel is known to exist, the dental caries rate in 3,481 children was as high as 415 affected teeth per 100 children. A special study of nine-year old children showed the percentage of children completely free from tooth decay is five times as high where the drinking water contains appreciable amounts of fluorides as where the water is relatively free from the mottling substance. However, dentists do not yet advise drinking fluoride water. They point out that the fluoride may not have caused the immunity, but some unknown constituent in water that either appears only where fluoride is present, or in greater concentrations in water containing fluoride, or that acts to produce immunity only when associated with fluoride.

## Light-Weight Electric Ironer Controlled by Elbow Touch

So light that it can be carried easily around the house, an electric ironer just introduced plugs into the wall socket anywhere and uses no more current than an ordinary iron. It has just two controls—one the switch for the heating element in the shoe; the other an elbow lever that starts or stops the roller instantly.



This portable ironer uses no more electric current than an ordinary hand iron



# 'City of Tomorrow' Seen from Hanging Walk

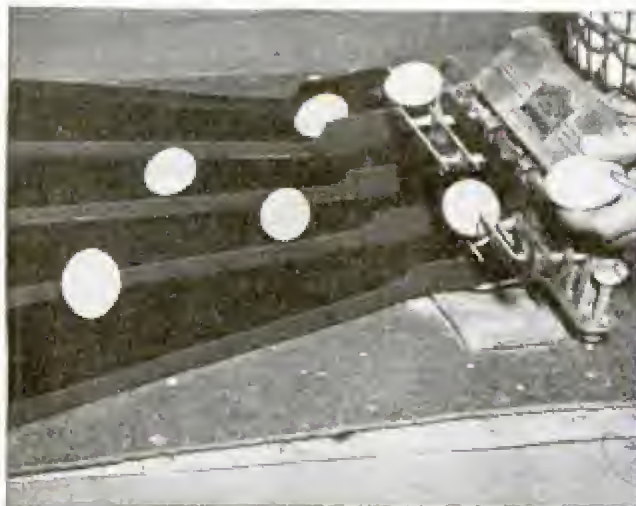
Visitors to the New York world's fair in 1939 will view the "City of Tomorrow" from moving platforms suspended inside the vast 200-foot perisphere. This will be the dominant feature of the exposition's "Theme Center." The two circular platforms will move in opposite directions at a speed calculated to let 8,000 spectators see the exhibit every hour without crowding. The view during the six-minute trip will be the equivalent of an airplane trip at 7,000 feet over the city of the future.

At the right is an artist's conception of the "City of Tomorrow" and the moving observation platform circling inside the 200-foot perisphere under construction at New York fair



Architects { Wallace R. Harrison, 45 Rockefeller Plaza, and Andrew F. Smith, 45 Rockefeller Plaza

## Two-Track Grader Sorts Eggs into Rubber Runways



Eggs placed on balanced rails at right are sorted into rubber channels according to weight

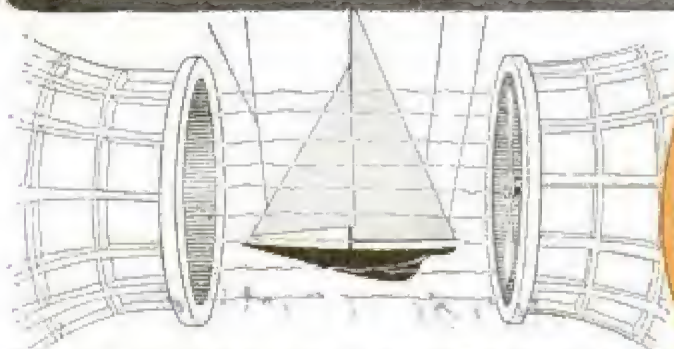
Grading of eggs is speeded up by a four-lane sorter now available. The eggs are rolled down a double track that is divided into four sections, each section being carefully balanced to its particular weight. As they roll across the sorting track, the eggs are lowered into the proper rubber runway, the heaviest eggs falling first and the smallest in the last section.

When you talk into a microphone it generates only one hundred-billionth of a watt and its energy must be amplified fifty quadrillion times (fifty followed by fifteen ciphers) to reach the antenna power of the largest broadcasting stations.

Perfection Egg, S. E. Review



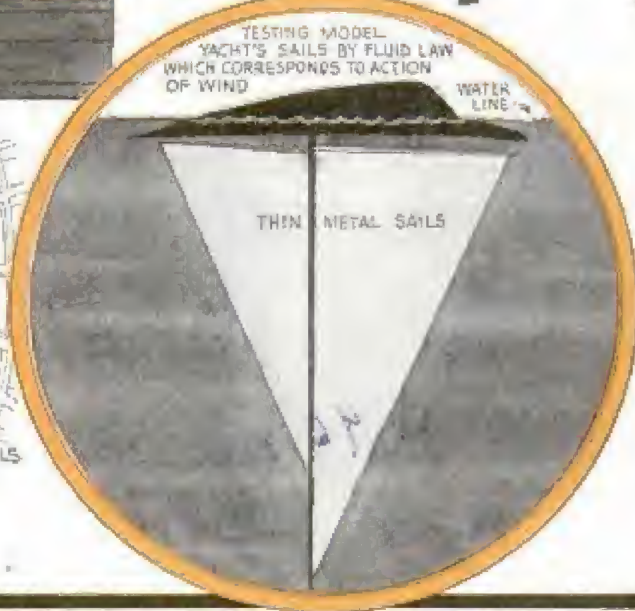
# Science Puts Speed into Big Racing Yachts



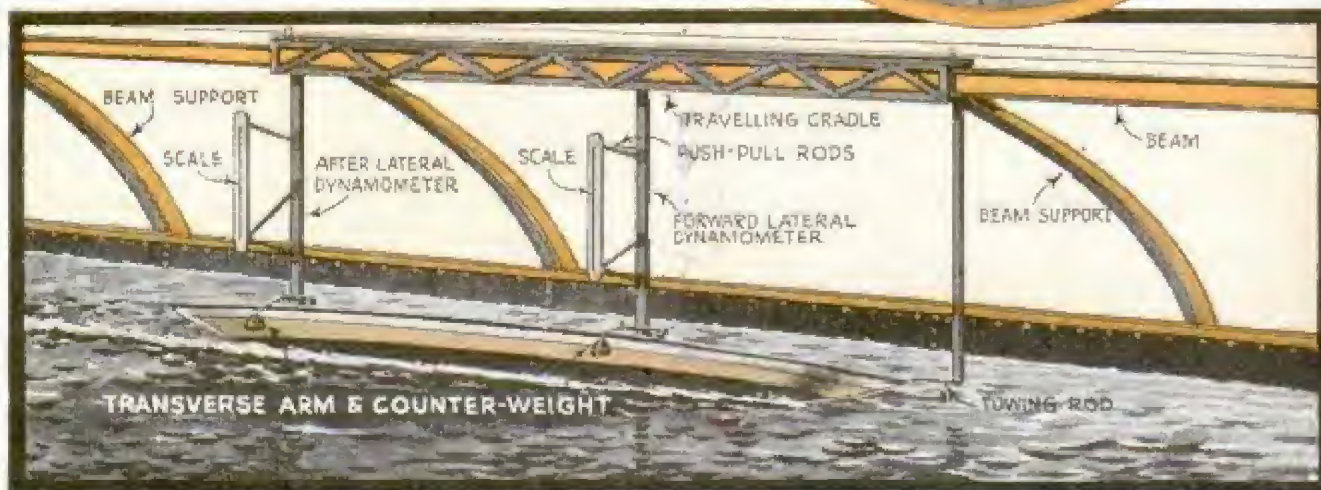
WIND TUNNEL TESTS FOR TRYING OUT DIFFERENT FORMS OF SAILS



IMPROVING DESIGN BY USE OF MODELS AND TANK TESTS



TESTING MODEL RACING YACHT HULL





# Hull and Sails Shaped for More Efficiency

How the big, expensive racing yacht has been developed from the small, slow craft of nearly three centuries ago is outlined on this and the page opposite. Note comparison between the types of 1660 and 1938, particularly the difference between their sails and hulls. Early yachts had straight stems and sterns. The "Jullanar," built in 1875, was the first to get away from old conventions. Its designer cut away the straight contours at stem and stern and obtained an amazing increase in speed. Later the overhanging bow and stern were introduced. Now scientists are helping to make the yachts still faster, experimenting with hulls and sails and recording performance on special instruments in wind and water tunnels. On this page is a cutaway drawing of the modern racing yacht, equipped with hollow mast, flexible boom, owner's stateroom and comfortable quarters for crew.





## Combined Match and Drill Invented by Early Man



Here is the instrument Neolithic man used before his posterity invented matches and power drills

Some few thousands of years ago Neolithic inventors introduced a combination fire starter and hole borer. This ingenious tool has been placed on exhibit at the Detroit Institute of Arts, as part of a group of implements made as replicas of Neolithic relics found in a Swiss lake.

## Wheat-Field Vacuum Cleaner

### Rids Farm of Crickets

After losing his wheat crop to an army of crickets, a western farmer declared war on the pests and, quitting crop-raising to



Twelve-foot nozzle of this warlike machine sucks crickets in to their destruction

become a machinist and metal worker, started experimenting on a cricket destroyer. The result is a huge vacuum cleaner that rolls across the field at five miles an hour and sucks the crickets into its twelve-foot nozzle. A forty-inch fan run by a four-horsepower motor supplies the "whirlwind." As the crickets are picked up by the vacuum they are crushed and tossed aside. By using vaporized poison in the fan housing, the dead crickets can be used as bait for the surviving insects. In the fall the machine is used to vacuum-clean fields of weed seed. Another use is cleaning dusty and moldy hay in the "reception chamber" at the top.

H 787

## Three-Wheeled Midget Car Built in Spare Time



Front and rear views of the homemade miniature automobile. It has a button-down top

In his spare time, stretched over eighteen months, a Californian built a three-wheeled midget automobile that has traveled sixty-eight miles an hour. It has a front wheel drive and rear wheel steering, and covers as much as forty to forty-two miles per gallon. There are buttons on the windshield for attaching a top.

G. Echeverria, 75



# Balloons Bring Rescue Plane to Jungle Party

Lost in a Central American jungle, provisions low, medical supplies gone, rescuers in sight but beyond reach. That has been the fate of many an expedition. When U. S. army detachments have sent out short-wave radio calls for help from isolated camps in the Panama Canal region, observation planes dispatched to their aid have been unable to find them. Even large bodies of men are invisible from the air in the tropical tangle of vegetation, and smoke signals



*Signal Squad*

*William Bailey*

*taken at Stanley*

© William La Varre

Above, inflating captive balloon. Left, plane picks up message on string between two signal balloons

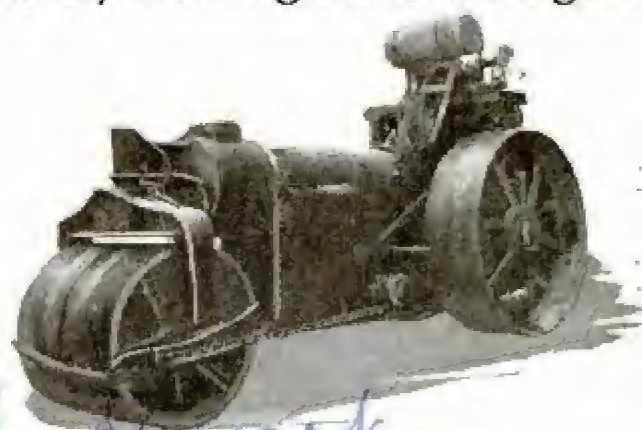


are dissipated by the trees or unnoticed in the swamp fogs. Now the 14th U. S. Infantry regiment, operating around the Atlantic entrance of the canal, is using bright orange-red balloons to signal to observa-

tion planes when calling for aid. On one of the mules in the army's jungle packtrain is a tank of compressed hydrogen. A rubber balloon is inflated to about five feet diameter and, anchored by a strong fish-line, allowed to rise above the treetops. The brilliant balloons are easily spotted from searching planes. If food or medicine is needed by the expedition, a message is placed in a small canvas bag tied to the center of a fifty-foot string at each end of which a balloon is attached. Held about 100 feet above the jungle treetops, the message sack is picked up by the pilot with a fishhook on a line hung from his plane.

## Ancient Steam Roller Revived by Taking on Gas Engine

Old age had gotten the best of an ancient steam roller. Its boiler and cylinders beyond repair, the heavy roller was ready for a last ride to the scrap iron yard when a mechanic restored it to life with a gasoline engine. The motor, from an old automobile, was mounted on top and the transmission connected to the original gear train of the roller. Back in service, it was used recently on street pavement work in Badin, North Carolina.



*Emil W. E.*

*Stewart*  
*143 Pine Ave*



74923

Eastman Kodak Co.  
Rochester, N.Y.

# "CLICK" AROUND



**J**UST a few years ago, picture-taking was a mid-day hobby. Few amateurs tackled pictures in the early morning, late afternoon, or at night. If the sun wasn't shining brightly, snapshots were just not made.

Today, all that is changed. Films are faster. Cameras have been improved. Inexpensive cameras are now equipped with lenses which a generation ago would have been considered quite fast. Ultra-fast films and lenses have turned night into day, photographically. Dull days, misty and rainy days, no longer forbid picture-taking, but invite it.

Nowadays, almost any amateur photographer can take pictures right around the clock. The owner of a super-speed miniature, for example, may find his chief pleasure in snapping pictures under adverse light conditions which demand the full lens speed of his precision camera. Similarly, the owner of an inexpensive camera may go out at night to explore snow-covered streets and byways, sparkling under the glow of street-lamps, or rain-drenched pavements which offer glistening reflec-



Top, photo bulb beneath crystal ball lights "seance" picture. Below, sunset turns drabness to beauty



# The CLOCK

tions that "make" memorable night pictures.

There is fascination in picture-taking at unusual hours. At the extremes of day—dawn, sunset and night—Nature's moods are most interesting. Mist, cloud and shadow give homely things a romantic quality that is missing in the glare of mid-day. But there is still another point that makes these "odd-hour" picture excursions a pleasure—most people think such pictures ex-



*Mealtimes—especially spinach—offer opportunities for unposed pictures. When light is too weak for detail snapshots, try a silhouette*

tremely hard to take, and they marvel at the skill of the amateur who takes them.

The truth is, "odd-hour" pictures are about as easy as ordinary snapshots. But any amateur with a camera that can be set for a time exposure can take pictures at any hour. And any amateur who owns a miniature camera with a lens as rapid as

f.2.8 or f.2 can take snapshots with no more than the light of an ordinary match. For example, a snapshot of a man lighting his pipe in a dark room.

You need only learn how to judge the light to gauge exposures properly.

An exposure meter is a help. However, for most of us, the three-picture method will be best until we gain experience. Suppose we are picturing a dim scene which we estimate requires an exposure of four seconds with

a box camera. We make three negatives—one with a four-second exposure, one with sixteen seconds, and one with thirty-two seconds. Then, if we have overestimated the light, we will still get one satisfactory negative. The latitude of modern films takes care of reasonable exposure errors.

A fast lens is an advantage in "odd-





*Two floodlights in bridge lamps lit scene at top. Below, a fast lens catches matchlight picture, and misty morning provides atmosphere missing at midday*

hour" pictures of many types, particularly when a subject is likely to move. Obviously, with a lens twenty or thirty or sixty times as fast as that on an inexpensive camera, you can get many pictures that would otherwise be impractical. But for some types of "odd-hour" photographs,

the inexpensive camera is about as useful as any other. Here are some examples:

**Real Moonlight Pictures:** Wait for a full moon and clear night. If there is snow on the ground, so much the better. Place the box camera on a firm support, and expose for thirty minutes to an hour. Do not in-



14923



*That beautiful moonlight scene wasn't moonlight at all. It was snapped just before sunset, an exposure of 1/100 second at f.8. Bedtime is a good time for "odd hour" pictures with flash or floodlight. Tabletop pictures like the amusing one below can be made "around the clock"*



clude the moon in the picture, for it will show up as a white streak.

**Pictures of Sunsets:** Wait until the sun is slightly veiled or hazy, and cloud masses nicely shaped. Then take a snapshot of the sunset, preferably using the smallest lens opening on the camera. With f-numbered lenses, use f.16 at  $\frac{1}{100}$  second. These pictures are nice with a silhouette—person, tree, or other object—in the foreground to

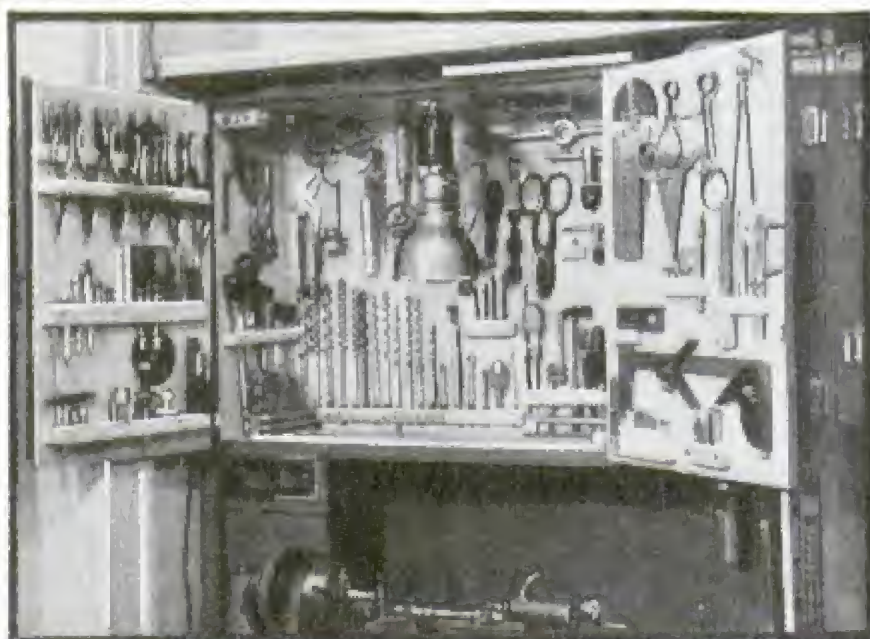
(Continued to page 114A)



# Complete Home Workshop in a Kitchenette

No room in your home for a workshop? One man packed his, complete to wood and metal-turning lathe and other power tools, in a compact cabinet occupying only eighteen by thirty-five inches of floor space in the corner of a seven-foot-square kitchen-

ette. Lacquered and trimmed to match the kitchen equipment, the shop is unobtrusive and does not interfere with household work. The lower part of the cabinet stores the lathe, circular saw, drill press and miter box. A one-third horsepower electric motor is bolted to rails on the back wall. The top section is detachable for convenience in moving, and is bolted to strap iron screwed to the bench top. An extension to the right of the main top section provides storage space for paints. After building the cabinet and fitting the doors and drawers, this workshop enthusiast made paper layouts the exact size of inside walls and doors, then laid his tools out to find the most efficient arrangement. Tools which could not be hung on screw hooks were fitted in special wooden racks. No nails were used except in assembling the small drawers, and in that case the



*Top, doing a bit of shopwork on kitchenette lathe. Right, compact arrangement of tools in upper cabinet. Below, workshop closed for cooking hours. It occupies only eighteen by thirty-five inches of floor*

nailheads were sunk and the holes filled with plastic wood. The drawers were slotted to run on guides, saving the space that would have been taken by rails. The top cabinet has an electric light on an extension bracket so that it can be moved to any position over the bench. A switch turns on the light when the door is opened. The cabinet is solidly built, permitting the use of power tools without vibration that might disturb apartment neighbors. To assure easy sliding, the drawer slides are greased occasionally with vaseline.



# Torch and Lathe Team Up to Spin Hard Metal

Metals as hard as nickel-steel, steel, copper and aluminum can be spun into shape on an ordinary lathe by the use of the oxy-acetylene flame. The method promises great savings to machine shops in fabricating parts from drawings, eliminating die work, casting and other processes. It may find special usefulness in making airplane parts. The lathe is geared up to at least 3,600 revolutions per minute. An ordinary spinning tool is placed in the lathe, tubes of the desired metal are placed in the chuck and a fine oxy-acetylene flame is focused on the point where the spinning tool is pressed against the metal. The torch is geared to the same carrier as the spinning tool, and so moves with it automatically. Perfectly round balls of hard metal, sealed at both ends, can be made in this manner.

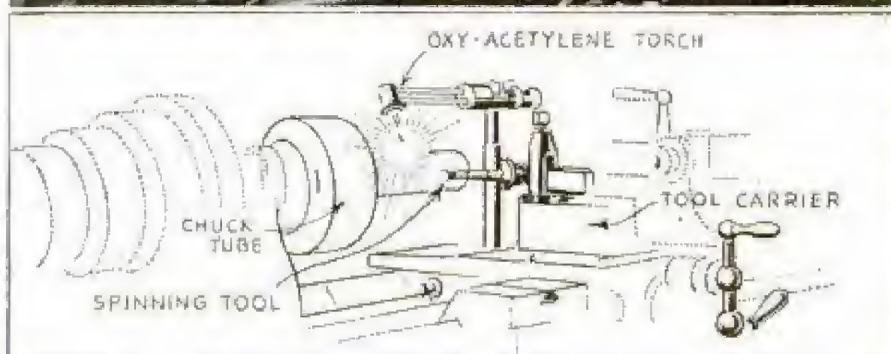
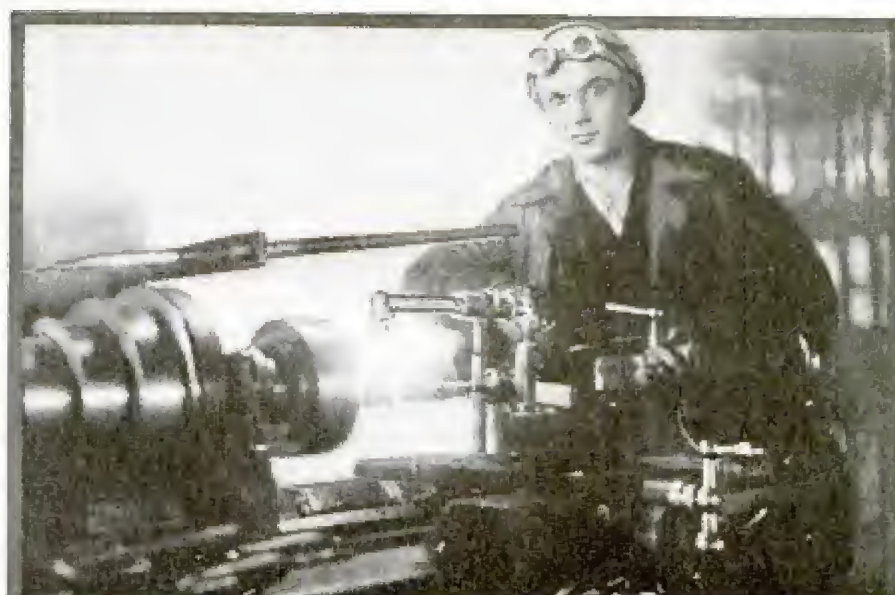


Photo and diagram show how oxy-acetylene flame is focused where spinning tool works metal. Below, some hard metal products spun in this way

## Homemade "House on a Raft" Tours Mississippi River



Oars and river drift furnish a vacation tour

For a vacation afloat, a California couple built themselves a houseboat and drifted down the Mississippi valley from Chicago to New Orleans. The boat was simple but comfortable, its boxlike cabin set on a flat-bottomed boat that could be propelled by oars. The river drift, however, supplied most of the motive power.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

Mr. and Mrs.  
A. W. Anderson.

Ivan 2 Cremer 211 Cherry St. Chicago, Ill. Pa. 2034



# Fishing Boat Has Luxuries of an Ocean Liner

Florida sportsman's fishing boat can be navigated from cabin, below, or rooftop bridge seen at right. Its telephone connects with shore stations



Cruising the fishing grounds of Florida's west coast is a trim new power boat endowed with the comforts of an ocean liner, fully equipped to follow game fish into any waters, a boat that runs itself. Built to meet the demands of a Tallahassee sportsman and business man, the "Sarah-Ellen II" has automatic clutch and throttle controls and a robot steering mechanism that can be set to a course and left to itself. This robot pilot compensates for tides, wind and similar conditions. The skipper

may, if he wishes, steer by remote control from the harpoon pulpit, the crow's-nest, engine room, or elsewhere; or he may press a button to throw out the mechanical wheel and guide the boat by old-fashioned manual control. The master controls in the cabin are duplicated on another "bridge" atop the cabin, used for quick maneuvering when a fish is hooked. Electric refrigeration is used both for food and to keep fish and bait fresh. Tanks in the stern provide running fresh or salt water to keep fish alive. There are shower baths with hot and cold fresh or salt water, and accommodations for six guests and a crew of two. The skipper can keep in touch with business by means of a ship-to-shore telephone whose dials are calibrated for calling the coast guard, ships, or shore stations. The two engines are eighty-four-horsepower Diesels giving the boat a speed of fourteen miles an hour.

## Northern Lights May Be Seen but You Can't Hear Them

So you've heard the northern lights? Oh, no. Plenty of witnesses have sworn they heard a swishing, as of a silk dress, or of wind whistling through the rigging of a ship. Some have even testified the sound faded and swelled as the light of the aurora

J. W. Simmons, Pres. of the Tallahassee Fishermen's Association

Chris. Craft Co. Algonac, Mich.

H 927



dimmed or increased in intensity. But Dr. A. S. Eve of McGill University in a report published by the Smithsonian Institution asserts that the northern lights are at least sixty miles away in the rarefied upper levels of the atmosphere, and even if they produced sound waves those waves could not reach you—for conditions at the altitude of the aurora are close to a vacuum; sound waves cannot travel in vacuum and so they could not reach the earth. Dr. Eve believes the swishing sound mistaken for the singing of the aurora borealis may be the noise of a local brush discharge, similar to St. Elmo's fire. Such a discharge from snow or bushes does occur in dry, cold weather.

## Twelve-Cylinder Race Car Has New Streamline Form

Almost as flat as a pancake, a racing car built to conform to the new requirements of the French Grand Prix race is testing out a fresh streamline form. The wheels are sheathed to reduce wind resistance, and the driver sits low in the shallow car, the sides, front and back sloping up gently to his head. The rules reduced the number of cylinders in the motor from sixteen to twelve.



Putting new twelve-cylinder racer through its paces. This radically streamlined car is designed for French Grand Prix race

## Thrill Driver in Triple Roll Inside Flame-Drenched Car



Top, carnival reaches climax as blazing car with driver strapped inside rolls over thrice. Below, "ski jump" on two wheels

Climaxing a program of race-track thrills, Ace Lillard of Texas drives his flame-drenched automobile around an arena and then plunges it into the air from a five-foot ramp, swerves the wheel and rolls over three times. A bucket of gasoline is hurled over the car as he starts around the circle. A torch sets it aflame. Lillard is strapped into his seat, and sits tight until the sedan tumbles to a standstill; then looses himself and leaps to safety. His wife is another member of the daredevil troupe. One of their stunts is to "ski jump"—race up the ramp with two wheels, tilting the car dangerously as the other two wheels remain on the level, then speed on as far as possible poised on two wheels.



## Traffic Filmed from Car to Teach Safe Driving

Movies taken from the driver's seat of a car moving through traffic help "drive home" safe driving practices in a Chicago

high school. The instructor makes his own classroom films, mounting his Filmo camera on a tripod with the lens, at eye level,

focused through the windshield. The car has dual controls for practice. As the motorist encounters traffic problems and emergencies the camera records the scene, and the film is afterwards screened in the classroom while the pupils manipulate dummy controls as if driving through the same traffic. Flashing lights on indicator panels tell the instructor just what each student driver does with each control as different emergencies arise.



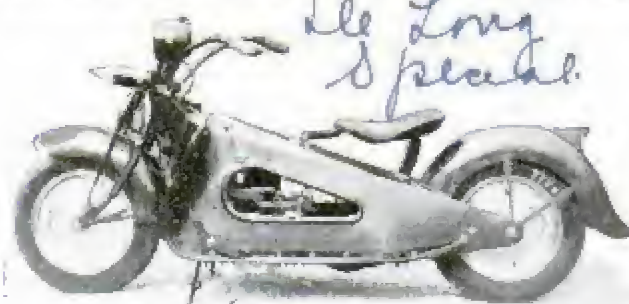
Above, driver of dual-control automobile films traffic scene with movie camera fixed on tripod in front seat. At right, same scene is projected in classroom while student drivers manipulate dummy controls



## Motorcycle of Pressed Steel Drops Conventional Tubing

Traditional use of tubing in motorcycle construction was abandoned in the design

of a motorcycle whose frame is entirely of pressed steel. Even its wheels, fenders, leg shields and footboards are made of stampings. This new departure held the weight of the fully equipped machine under 200 pounds and reduced the cost materially. The footboards run almost the full length of the frame, their forward ends curving upward to form leg shields. The gas tank is attached to the underside of the top of the frame. Aluminum-disk wheels, made in two pieces bolted together, are mounted with twenty by five and one-



Frame, fenders and footboards of this motorcycle are of pressed metal, and wheels are aluminum disks

*Handwritten notes:*  
 Designer - E. M. De Long  
 Le Long Special  
 H. and C. Motor Supply Co. / Cleveland  
 1137 E. 11th St. / Cleveland

*Handwritten note (vertical):*  
 Bell and Howell Co. / 1803 Larchmont Ave. / Chicago

*Handwritten note (vertical):*  
 Bell and Howell Co. / 1803 Larchmont Ave. / Chicago



half inch low-pressure tires. The saddle is low, only twenty-three inches above the ground. A fan sends a positive draft through cylinder fins by way of an aluminum trough to cool the motor, which delivers 90 to 100 miles for every gallon of gasoline; the engine is a single-cylinder, two-stroke type, lubricated by mixing oil with gasoline and equipped with a hand-operated starter. The complete power plant can be removed from the frame and used for other purposes by withdrawing four bolts.

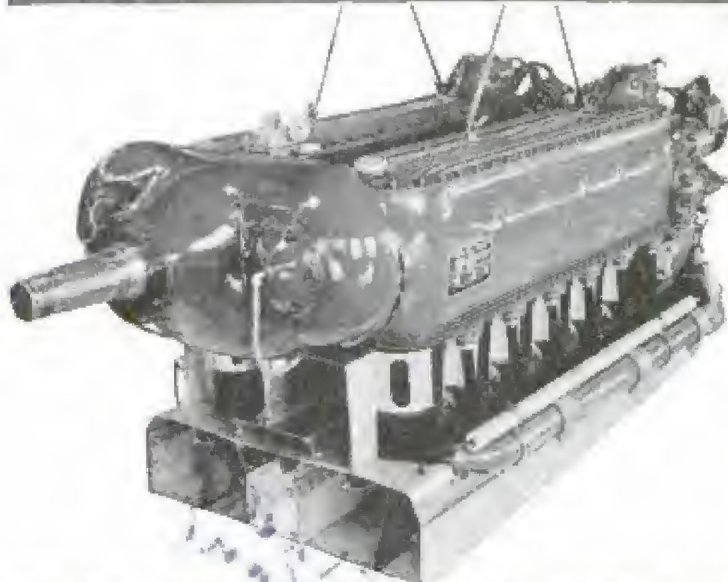
### "Ship" Ventilators on Cab Cool Off Truck Driver

Bullet-resistant windows gave a truck driver a sense of safety after several hijacking incidents, but they also made the cab unbearably stuffy and hot. So the driver installed "nautical" ventilators in the roof. Two elbows of stovepipe were set over the cab like the air vents on a ship's deck, and were provided with caps which could be closed easily from the inside.



Truck driver took a tip from ocean liners and installed stovepipes to bring fresh air into cab

### Two Plane Motors Team Up to Drive a Single Propeller



If either of these twin engines should fail, over-riding clutches permit the remaining motor to drive the propeller alone

Teamed in such a way that either motor can fail without disabling the airplane, two in-line engines mounted side by side have been geared to drive a single propeller shaft. Over-riding clutches are the "harness" that makes this team work together smoothly, for they permit unequal amounts of power to be taken from the two engines; or, if one bank of cylinders fails, the full load can be taken by the unit still functioning. The motors are air-cooled six-cylinder Menascos, each delivering 260 horsepower for a total of 520 horsepower turning the propeller.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

cm. H. D. Rabard  
12 20 W 9 H Japlin, Mo

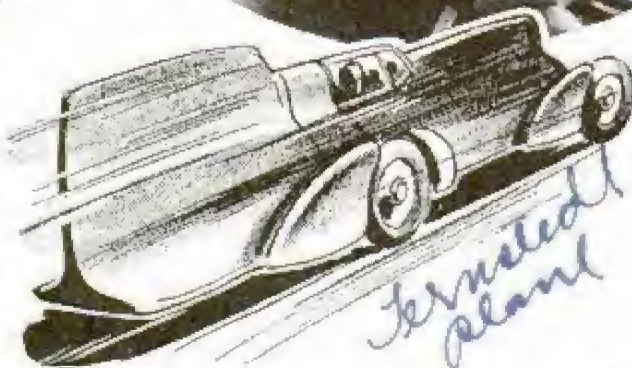
Calvin  
Super Bucon  
Japlin, Mo  
advice  
Cubby  
Sept.



H 53

E. d. du Pont de Nemours & Co.  
Wilmington Del.

## CHEMISTRY



Top, master silversmith making dies for Fisher metalware. Below, air rushes through carburetor at speeds approaching land speed record of more than 300 miles per hour

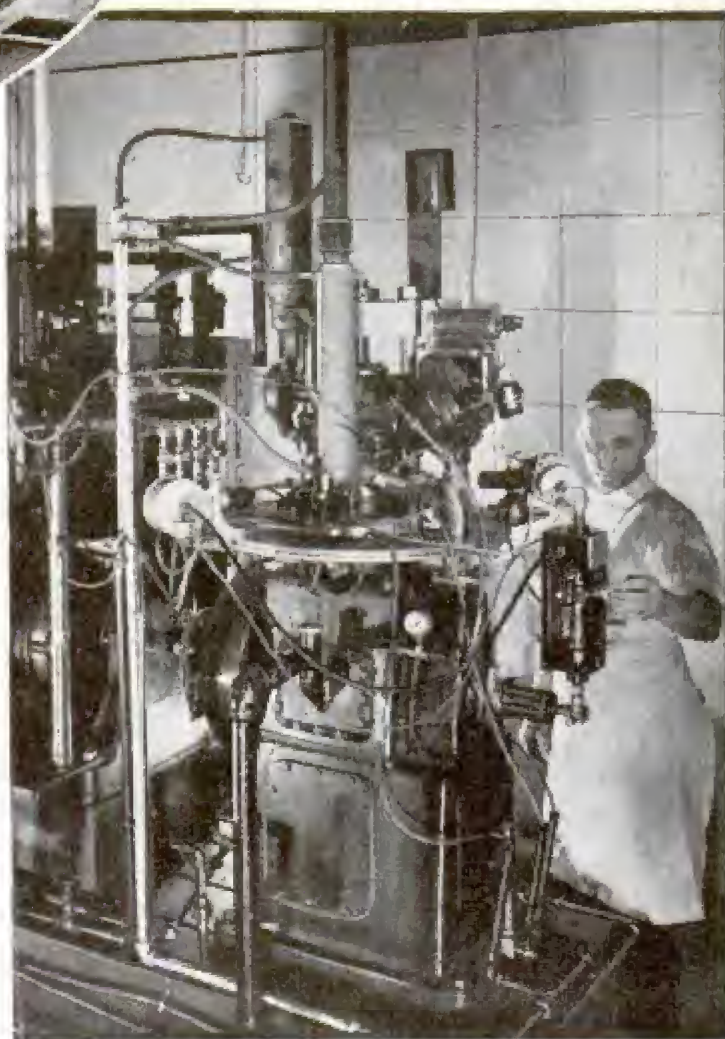
By H. W. Magee

**S**UPPOSE a 1918 automobile selling for \$1,500 had been sealed so tightly in a glass case as to be entirely unaffected by the march of time. The car is still like new. Nothing has deteriorated. There's not a particle of rust on it, not even a speck of dust.

How much would you offer today for that \$1,500 car of twenty years ago if it were in the same condition as when it rolled off the assembly line? Would you bid \$100? You would probably get it if

you did because most people wouldn't accept it as a gift.

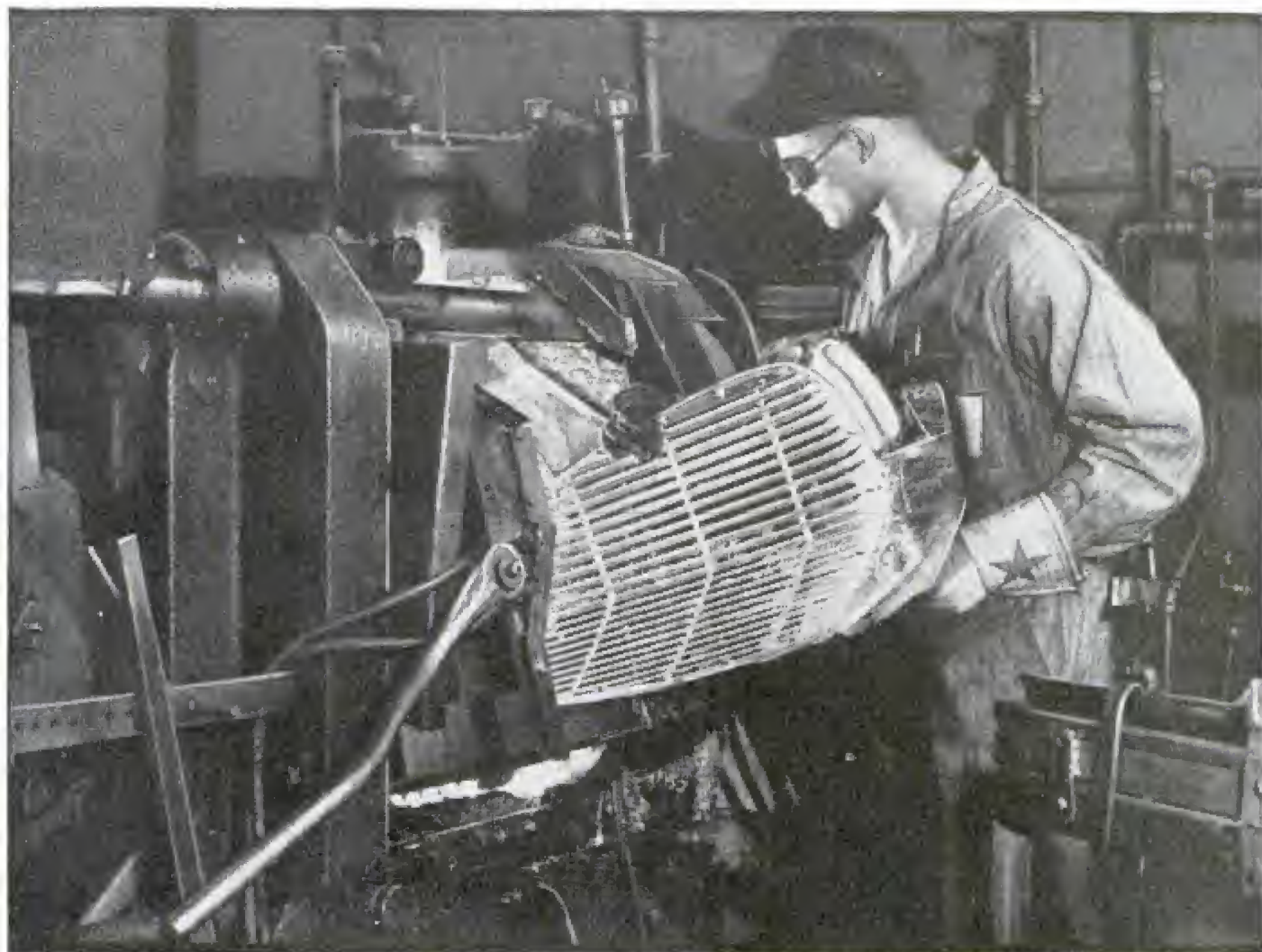
And yet, nothing has happened to this theoretical car to alter its value. It's still brand new. The car has been made worthless, not by what has happened to it, but by what has happened to automobiles since it was built. That 1918 car was built of makeshift materials, many of them not adapted to the purposes for which they were used. Today's car is constructed of tailormade materials,



Single-cylinder engine being used for fuel research in General Motors laboratories



# *and* YOUR CAR



new products and processes developed largely by chemical research.

And as the magic hand of the chemist has touched one part of the car after another, each part in turn has been made not only better but less costly. As a result, better cars are made today for less money—so much better and for so much less that most people wouldn't accept a brand new 1918 model as a gift!

Consider the finish of that 1918 job—some fifteen or twenty coats of paint and varnish laboriously applied and slowly dried over a period of several weeks. When the paint faded and cracked—and it always did—repainting cost from \$75 to \$100 and your car was in the paint shop two or three weeks. Even as late as

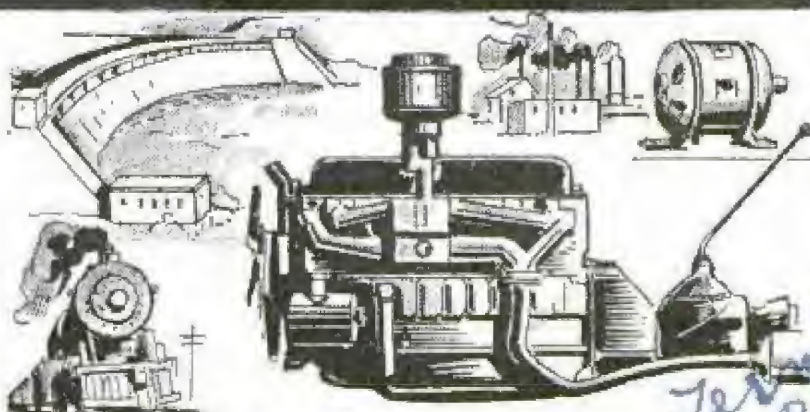


Photo courtesy E. I. du Pont de Nemours & Co.

*Top, step in making chrome-plated radiator grille. Below, auto engine, which produces eighty-five per cent of all power generated in U. S. by installed plants, compared to other power producers*

1922, body finishing required a week and a half. Enamel had to be baked on fenders by a slow, expensive process. And the enamel had to be black. In one factory \$20,000,000 worth of cars were tied up at one time awaiting various stages of body finishing. That delayed deliveries and cost





money. The automobile industry clamored for a finish which could be applied in hours instead of days and weeks, one which would not require high drying temperatures and which would be applicable to all colors and would last the lifetime of the car.

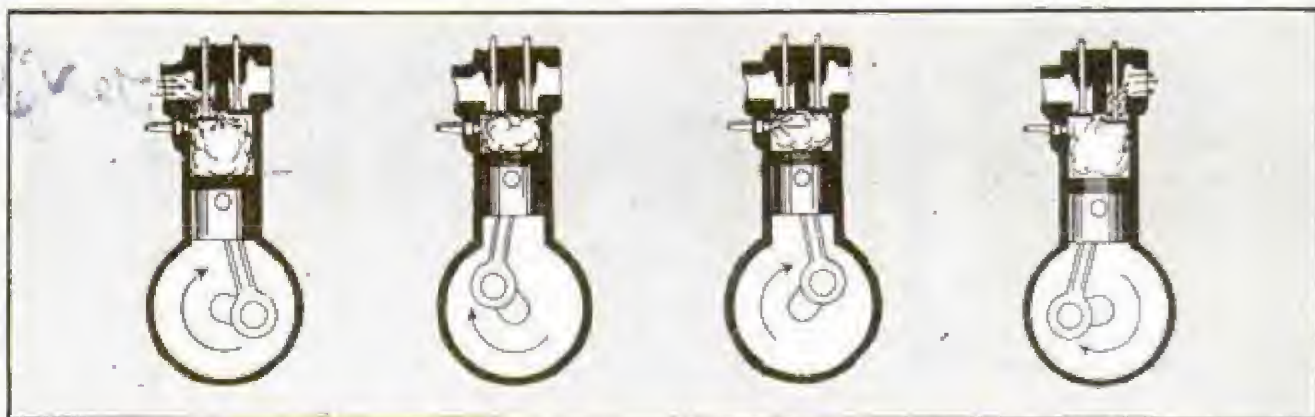
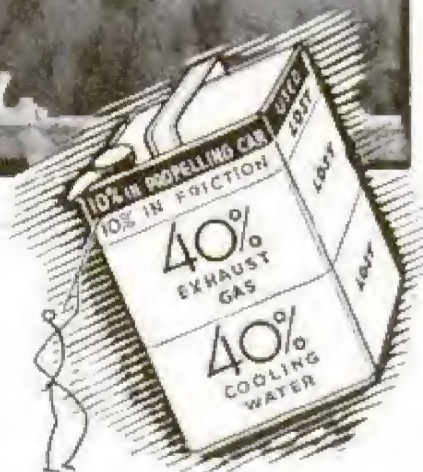
And chemistry gave the car industry just that. Research men of E. I. du Pont de Nemours and Company knew toy manufacturers were using a colorful lacquer but many coats of it would be required to give a durable film. Then they experimented with cellulose nitrate, used for making smokeless powder, and found how

to reduce its viscosity. Finally they discovered that butyl alcohol, long a drug on the market, could be used as a lacquer solvent just as effectively as amyl alcohol or "banana oil" which had become scarce. They introduced other substances to give durability and the result was "Duco," a glossy, durable finish to which pigments and dyes could be added and which dried quickly and could be sprayed on.

Today nearly all cars have a lacquer finish but the finish on your car today is far different from the lacquer of five years ago. Some of the early lacquer finishes had a tendency to "chalk" and some of the colors did not stand up. Today a good lacquer job will last as long as your car lasts. Colors do not fade appreciably and the gleaming surface remains bright and shining if the finish is kept free of dirt and

grime. And this beautiful, durable finish can be applied quicker and costs less than the old paint and varnish job. Chemistry has given you a better "paint job" for less money.

Tires on that 1918 car were good for a few thousand miles of very uncertain service. Only fifteen years ago, hardly anyone dared make a trip without a tire



Top, chrome-plating Pontiac grilles. Below, diagram showing only ten per cent of gasoline energy is used in propelling car. Bottom, demonstrating how auto engine works



repair kit tucked under the front seat. Today, riding on tires that cost less, you expect 15,000 or 20,000 miles of virtually trouble-free service. The raw rubber used in tires today is about the same as that used twenty years ago. Tires have been improved in design and structurally and the carcass has been strengthened by the use of cord fiber, but the better wearing properties of treads result from the addition of about a dime's worth of chemicals in each modern tire.

Ninety-nine years ago Charles Goodyear discovered that heating rubber with sulphur caused the rubber to become tough, very strong and elastic. This process is known as vulcanization. The characteristics of rubber can be further altered by incorporating in it various minerals, carbon black and chemicals. When vulcanization first was discovered, the chemical reaction be-



tween the rubber and sulphur required several hours. Today accelerators and vulcanization activators speed up the process and well-cured rubber is obtained in a few minutes instead of several hours.

While these accelerators—products of chemical research—have reduced the time and temperatures required for curing, they have done much more than that. The accelerators are entirely consumed in the curing process and add desirable properties to the rubber. They also make it possible to use a smaller amount of sulphur, and rubber with a small amount of sulphur is better for tires.

Since rubber is a vegetable product, it is perishable. It is subject to oxidation, it hardens and



Top, designing radiator ornament. Center, what car expels after burning air and gasoline. Bottom, steering wheel, control knobs and some accessories are made of plastics

(Continued to page 116A)



## 'Two-Passenger' Harmonica Has Room for Duets



Doubling up for a bit of harmony on the "harmonica built for two." It is forty-one inches long

That old favorite song about the "bicycle built for two" can now be played appropriately on a harmonica built for two. There is plenty of room for a duet, and you could have a trio without crowding too much. The 320-note mouth organ was introduced at a recent trade show of the music industries.

## "Mother Goose" Bungalow Shelters Nesting Ducks

Looking as if it had been plucked right from the pages of a "Mother Goose" book, a bungalow for ducks stands on the shore of an artificial lake in Alexandria, Minn. This fairy tale cottage with sloping walls



More like a playhouse for children than a poultry roost, this toy bungalow is home to a hundred ducks

and crooked chimney has shuttered windows and flower boxes, and the glassed windows are indirectly illuminated at night with electric lights hidden in shallow boxes inside the window frames. It appears, at night, to be a busy little hotel, but the hundred or more residents of "Duck Inn" sleep inside in complete darkness.

## "Ammonia Suit" for Rescue Unit Protects Skin from Burns

To protect firemen and rescue squads from irritating and dangerous gases, a combination suit and mask enveloping the entire body is provided. One of the most commonly encountered irritants is anhydrous ammonia, used extensively in commercial refrigeration, which can burn the skin in a very short exposure. The "am-



This suit not only protects face and lungs but keeps irritating gas from reaching any part of body

monia suit" is made of rubberized airplane fabric, tested to prove it will shut out the gas. The trousers have feet attached, and fit well up to the armpits; the blouse has a drawstring at the waist, the blouse, hood and mittens being one piece. The mask, with breathing apparatus and fogproof eyepieces, is built in the front of the hood.

Built by Phil J. Roman, Alexandria

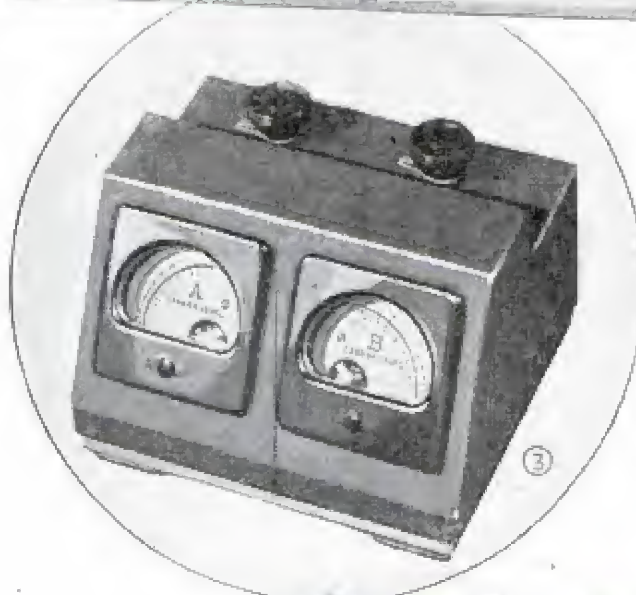
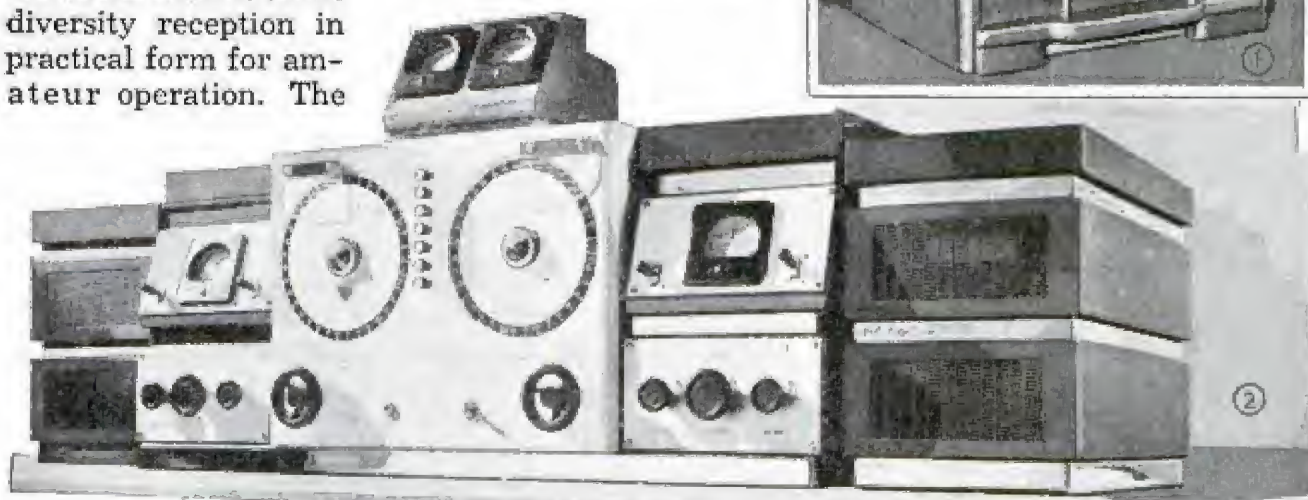
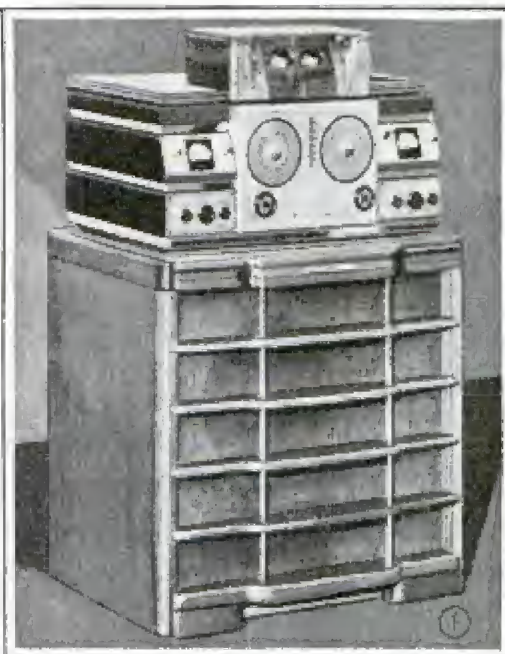




# DUAL-DIVERSITY *Receiver*

**A**CTUALLY two receivers under single control, this dual-diversity set employs two antennas about 100 ft. apart and at right angles to each other. Diversity reception is not entirely new to radio engineers, commercial radio stations having built diversity receiving systems, with striking improvements in the quality of short-wave reception.

This system now available to short-wave listeners and amateurs offers diversity reception in practical form for amateur operation. The



principal advantages are reduction of fading, increase of actual signal strength over that of any single receiver, improvement of signal to noise ratio and the reduction of heterodyne beat-note interference. The unit illustrated is the result of the combined engineering efforts of James J. Lamb, J. L. A. McLaughlin and Carl W. Miles. It consists of two complete r.f., i.f. and 2nd detector circuits with a common r.f. heterodyne oscillator, common a.v.c. and one audio amplifier. Photo 1 shows the receiver mounted on a speaker cabinet and a table assembly appears in 2. Meter unit, 3, shows signal strength of each circuit

*Hallicrafters, Inc. 2611  
Shelton Ave. Chicago*



A man in a patterned shirt is kneeling on the floor, working on a device. A young girl in a red dress is sitting on the floor next to him, looking at the device. A speech bubble from the girl says "6-VOLT BATTERY OPERATION". The background is a simple room with a bookshelf.

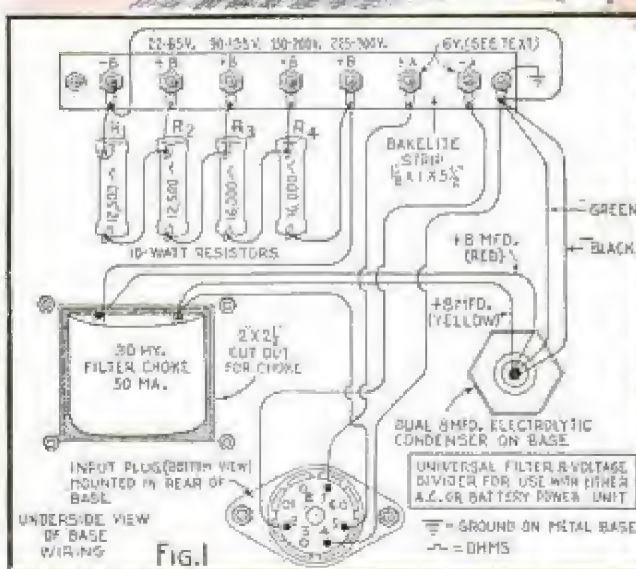


FIG. 1

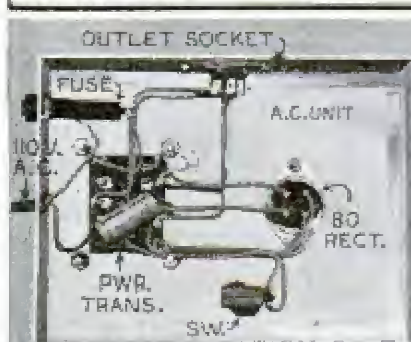
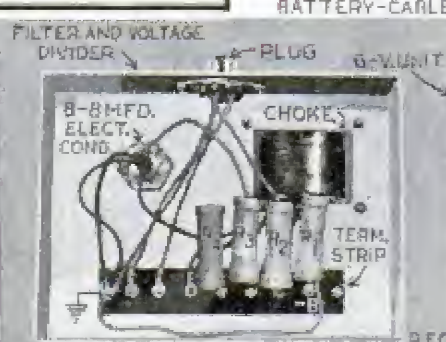


FIG. 2-A



### BOTTOM VIEWS

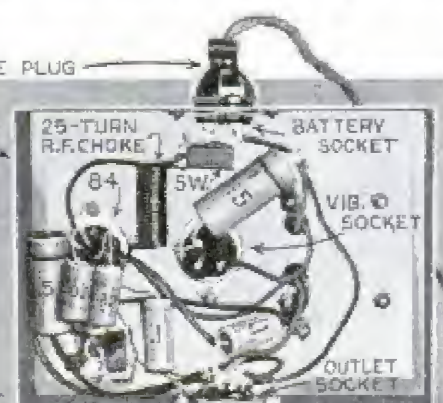


FIG. 3-A

One unit is for a.c. operation from a 110-volt, 50 to 60-cycle power line and converts the power to high d.c. voltage and also steps down the source of power to 6 volts for tube filament requirements. In another unit the same voltages are obtained from a 6-volt storage battery as a source of power. The average current drain from a storage battery for "B" voltage supply is only 1¼ amp. Connections are made to 4 of the prongs of output octal-type sockets located on both units. Filament leads are points 2 and 7, while positive-B connection goes to point 5; negative-B and ground run to the No. 4 prong.

The third unit is designed for use with either of the power supplies and incorporates a well designed filter and resistor network divider. Any positive "B" voltage from 22½ to 300 volts may be obtained in steps from 5 handy binding posts. Up to 50 ma. can be taken from the 225 to 300-volt post, and up to 20 ma. from any of the others. The 6-volt supply for filament needs is also brought out to 2 additional posts. This universal filter and voltage divider is detailed in Figs. 1 and 1-A. The octal male plug is a chassis-mounting type and the connections must be made just as shown so that the prongs will engage the



# an ALL-PURPOSE POWER SUPPLY

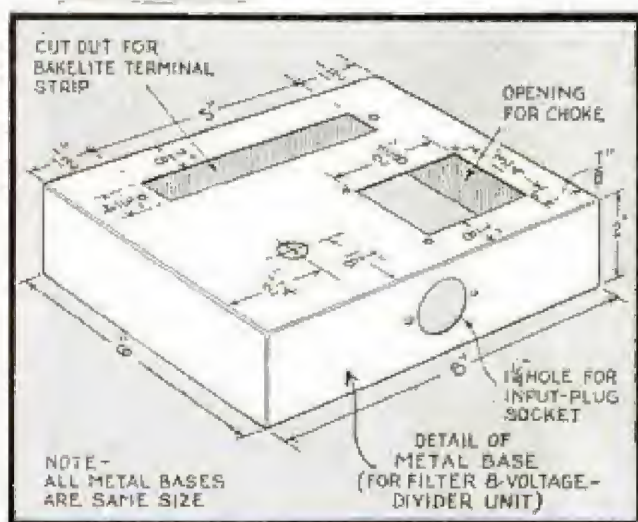
## For A.C. or Battery Operation

proper outlet socket connections in each power unit when plugged together.

All three units are built on metal chassis bases of exactly the same size; these bases measure 8 by 6 in. and are 2 in. high. Drilling details for the filter unit are given and the necessary holes in the other bases can be located easily by referring to the photos. These bases may be made by clamping the sheet metal between blocks of wood in a large vise, or they can be purchased formed and drilled if desired.

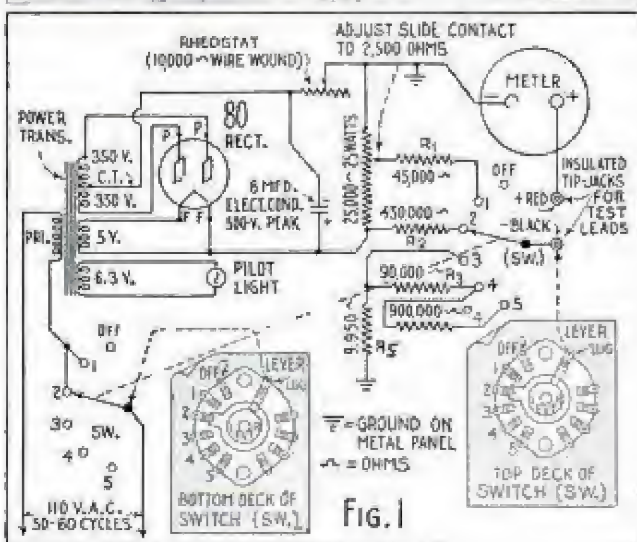
A wiring diagram for the a.c. unit appears in Fig. 2 and an underside view of the base is shown in photo Fig. 2-A. The power transformer is a low-priced variety and the rectifier tube is a type-80; a 110-volt toggle switch, .1 mfd. tubular-type condenser and a fuse in an extractor-type Bakelite case for panel mounting are required. The center-tap ground connection must be carefully soldered to the chassis base. Figs. 3 and 3-A show assembly and wiring details for the 6-volt power unit which employs a plug-in vibrator of the Philco replacement type, however, any non-synchronous variety with 4-prong base having the same internal connections can be used. The vibrator transformer is one having a secondary designed for d.c. output of 275 volts at 50 ma. It will be noted that a type-84 rectifier tube is employed in this unit, and a special hand-wound r.f. choke is required. This choke consists of 25 turns of No. 14 enameled copper wire close wound on a form  $\frac{1}{2}$  in. in diameter. After winding, the form is removed and the coil ends are soldered to the switch and vibrator-socket terminals so that it is self-supported above the base. The 24 mh. r.f. choke is a standard flat-wound type mounted on an angle bracket; a male 4-prong plug and seven ft. of 2-conductor battery cable are used to connect

(Continued to page 142A)





# Inexpensive Volt-Ohmmeter Operates on A.C.



ALL radio experimenters and service men will find this low-cost combination voltmeter and ohmmeter a most useful tool for set checking. Operating entirely from 110-volts 50-60 cycles a.c. for resistance tests from 0 to 1 megohm and 0 to 10 megohms, it can also be used to measure voltages in steps of 0 to 10, 0 to 100 and 0 to 1,000 volts d.c.

Any standard 1 ma. meter may be used by merely substituting a new scale which is available from radio supply houses. This scale is graduated 0 to 10 and 0 to 1,000 in reverse for resistance readings. The required 450 volts for the 10-megohm scale and the low voltage for the 1-megohm scale are obtained from a simple power supply which employs a type-80 rectifier. Points 1 and 2 on the "Yaxley" 2-pole 5-position double-deck non-shorting rotary switch control these scale readings and automatically switch "on" the a.c. power. Power is "off" when the knob is turned to the "off" position or to point 3 (0-10 volts), point 4 (0-100 volts), or point 5 (0-1,000 volts).

The sheet-steel panel is  $\frac{1}{8}$  by  $4\frac{3}{4}$  by 7 in., and a  $3\frac{1}{4}$  by  $2\frac{1}{2}$ -in. metal bracket is used to support the tube socket. All other parts are supported directly on the panel. The fixed resistors R1, 2, 3, 4 and 5 are "Continental" semi-precision 1-watt type, soldered directly to the switch points indicated; switch plate is marked "off-1-2-3-4-5." The half-shell power transformer is a replacement-type 110-volt primary, 350-350 h.v., 5-volt 2 amp., and 6.3 volt 1.5 amp. secondary. It is mounted directly back of the meter by means of a 2-in. angle bracket fastened to the panel with a machine screw. An "Aerovox" type PBS 8-mfd. electrolytic condenser is supported directly on the transformer terminals by its flexible leads. A 25,000-ohm "Ohmite" 25-watt resistor with slider contact is mounted on the panel in front of the tube by means of short angle brackets. The 6.3-volt pilot-light bulb in mounting bracket with socket and jewel is located directly between the rotary switch and rheostat. All circuit details are clearly shown in diagram Fig. 1. Please note that the tip-jacks for the test prods are marked for polarity

(Continued to page 146A)



*General Cement Mfg. Co.  
Rockford, Ill.*

# Practical RADIO SUGGESTIONS

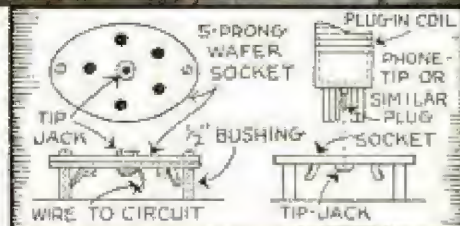
Two heavy wire brackets, covered with soft rubber tubing where they touch car door, are used to support a compact well known make of push-button auto set for demonstration and entertainment while customers at auto station are having car serviced with gas, oil and water



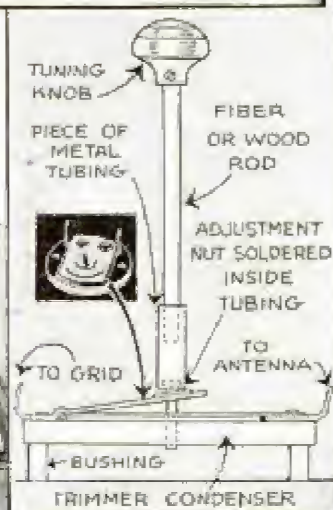
Below, practical workshop accessories for experimenters and service men. Adjustable chassis jacks support receiver in any convenient position for test and repair; radio bench lamp has flexible shaft and compartment base for knobs, screws and small parts



Right, when in need of a 6-prong socket and plug-in coil form, and only 5-prong material is at hand, the sixth connection may be added by means of a small tip-jack and phone-tip plug as shown in sketch



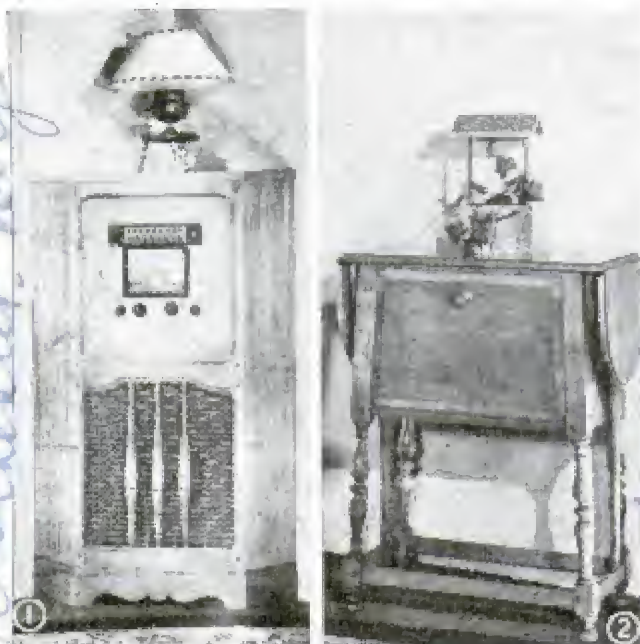
Below, vacuum cups, operated by suction from motor, hold platform for mounting public-address speakers on car top; straps prevent slip during parking periods. Right, non-capacity extension shaft for trimmer-type antenna-tuning condenser



*Vac. C. Corp.  
2023 Electric Ave.*

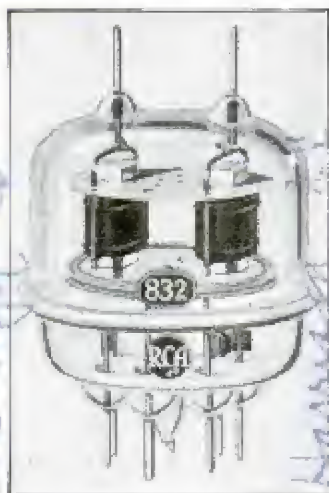


## Radio Cabinets in Period Designs Copied from Museum Pieces



Typical of a new radio style that introduces reproductions of period furniture, the corner cabinet of early American design shown in photo Fig. 1 houses a receiver which employs folded up tubing attached to the back of the loudspeaker. This tubing acts as the necessary baffle so that position in the room has no effect on tone. Another design, with all controls hidden, appears in photo Fig. 2.

## Two Beam-Power Tubes in One

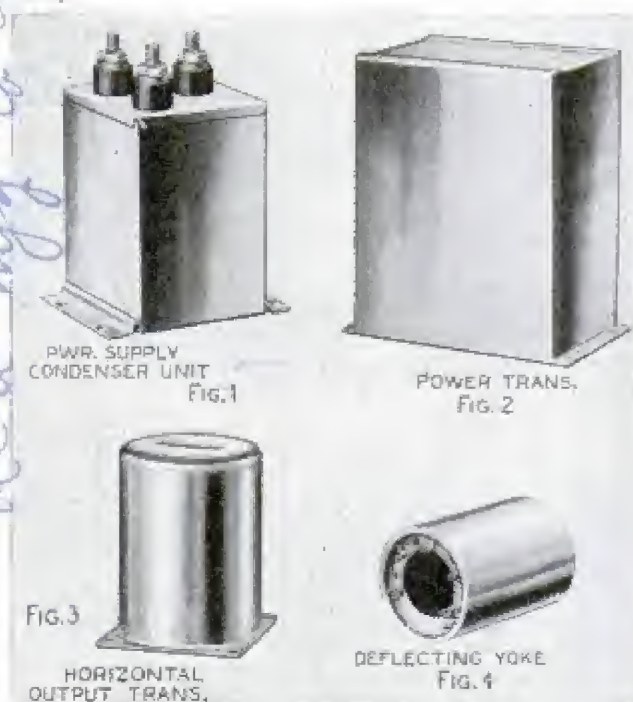


This type 832 r.f. transmitting tube consists of two beam-power units. It is intended primarily for service as a push-pull r.f. amplifier with maximum ratings at wavelengths as short as 2 meters, and with reduced ratings at wavelengths as short as

1 meter. Its total plate dissipation is 10 watts for class-C telephony. The heaters are connected in series within the tube, the center connection being brought out to a separate pin terminal, permitting either series operation from a 12.6-volt supply, or parallel operation from a 6.3-volt supply.

## Television Parts for Experimenters

In order to encourage amateur interest in television and cooperate with experimenters in that field, RCA has made available circuit data, and a group of specialized parts, four of which are shown below. They are designed for use by amateurs within radius of television transmitting stations who are equipped with sufficient technical knowledge to assemble their own "Kinescope" deflecting circuits for use in experimental video receivers.



Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

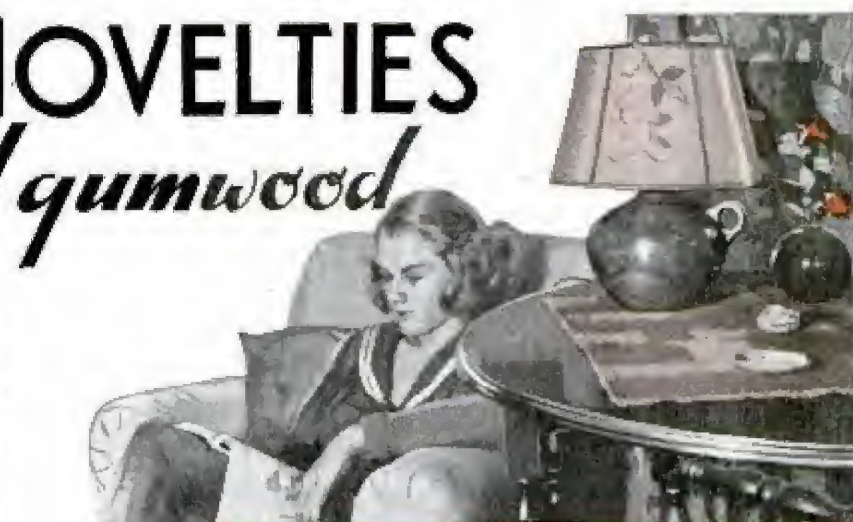
**NEXT MONTH—How to Build a Simple Portable Battery-Operated Receiver.** A really portable broadcast set for indoor and outdoor use; employs low-drain tubes in a conventional superheterodyne circuit with a few modifications. Also—A Ten and Twenty-Meter T-55 Transmitter in a Sectional Cabinet Relay Rack.





# TURNUED NOVELTIES *in figured gumwood*

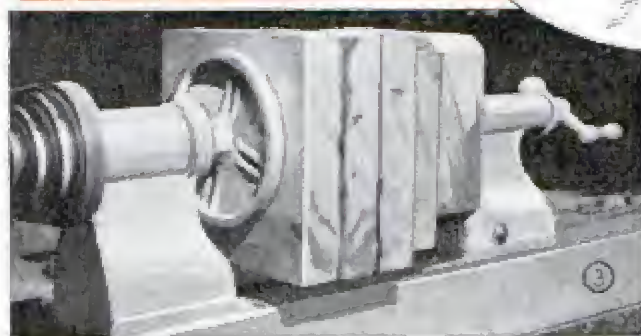
IT'S fun at your wood lathe to turn these novelties, which are not only attractive but of practical use in every home. First, the jug-shaped lamp base, Figs. 1, 2 and 3. Build up the rough block by gluing together four thicknesses of  $1\frac{3}{4}$ -in. selected gumwood. Clamp the block in the lathe as in Fig. 3 and allow the glue to dry. Then turn down to a template made from the crosshatched detail, Fig. 1. Before you bore the center hole, cut the mortise for the handle. The latter can be made from  $\frac{1}{2}$ -in. stock and fitted at this time as in Fig. 2, but do not glue it in place. Remount the work in the lathe and sand it thoroughly with fine paper. Then wipe on clear lacquer with a cloth, run the lathe at slow speed, and polish with a dry cloth. Next,



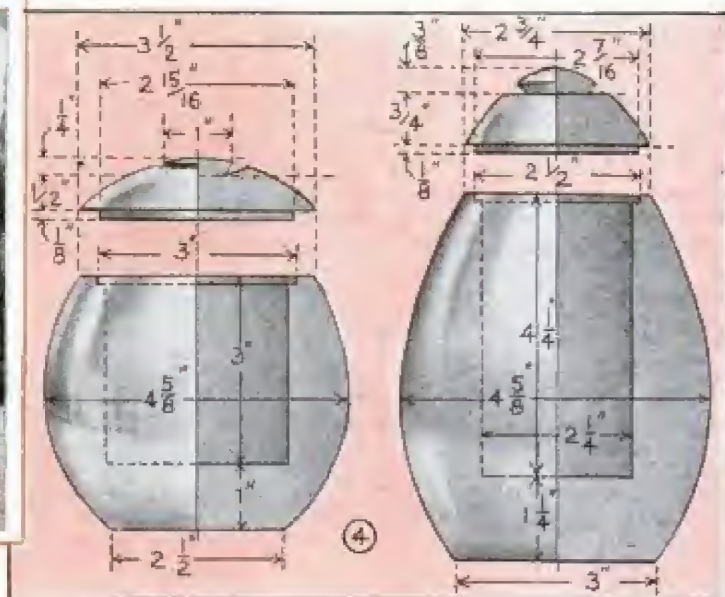
apply several coats of wax and polish in the same way. Glue the handle in place, Fig. 2, and quickly wipe off any surplus glue that is forced out of the joint. Let the glue dry, then finish the handle with wax. This done,

you can center a  $\frac{3}{8}$ -in. hole through the base and another at right angles for the lamp cord as in Fig. 1. Fit a flange for the socket and glue a disk of  $\frac{1}{16}$ -in. green felt to the bottom. That finishes the lamp base.

Now, Fig. 4 gives the turning details for a vanity set, consisting of a powder and







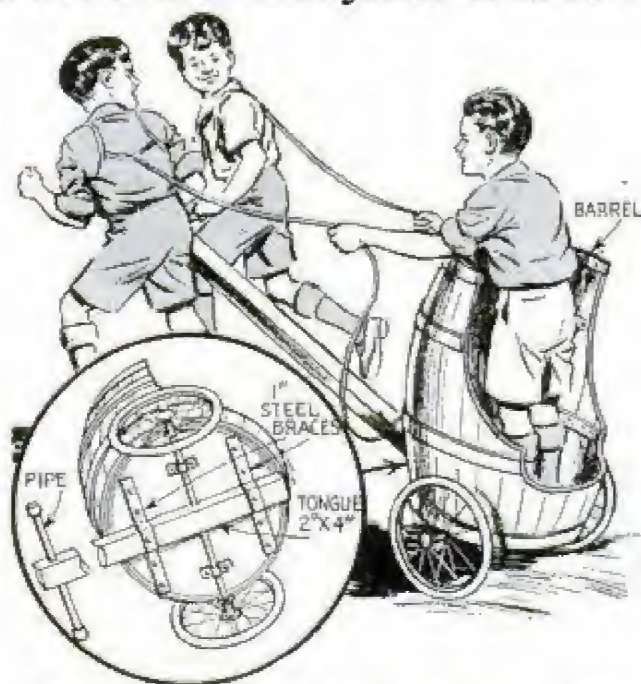
bath-salt container. The procedure in gluing up and turning out these pieces is almost the same as for the lamp base, except that there are separate lids and recesses. This means that both jobs must be finished up on the faceplate. If you have or can obtain solid stock it will do very well, but otherwise you first cut blocks oversize and glue up between centers, using the lathe for a clamp as before. When dry, true up to a cylinder between centers and then mount the work on the faceplate for turning the curve and recessing. The curves are not plotted on squares, as you can eas-

ily turn them by eye alone. Note that there is a rabbet at the top of the recess which is sized to take the rabbeted edge of the lid in a close fit. Now the trick in getting an attractive finish on this type of work is to do a good job of sanding while the work is still in the lathe. Keep sanding with progressively finer grades of paper until you get the surface glass smooth. Then apply clear lacquer and wax in the manner described before. Turn and finish the lids as a separate item; glue a disk of felt to the bottom of each container, and coat the insides with hot paraffin to seal the wood.

## Dashing Barrel-Body Chariot Thrills the Backyard Warrior

Here's a chariot you can make for the children that will provide lots of fun for them and their friends. All you need is a barrel and a pair of wheels from a coaster wagon or even an old baby carriage. Cut the barrel as indicated and put reinforcing strips of flat iron inside the barrel opposite each hoop, screwing both the hoops and the strips to each stave. The axle of the wheels is mounted on the barrel bottom with iron brackets, after which the tongue is attached as indicated. It's a good idea to sandpaper all of the edges carefully to avoid any possibility of splinters and then give the chariot a couple of coats of bright-colored paint.

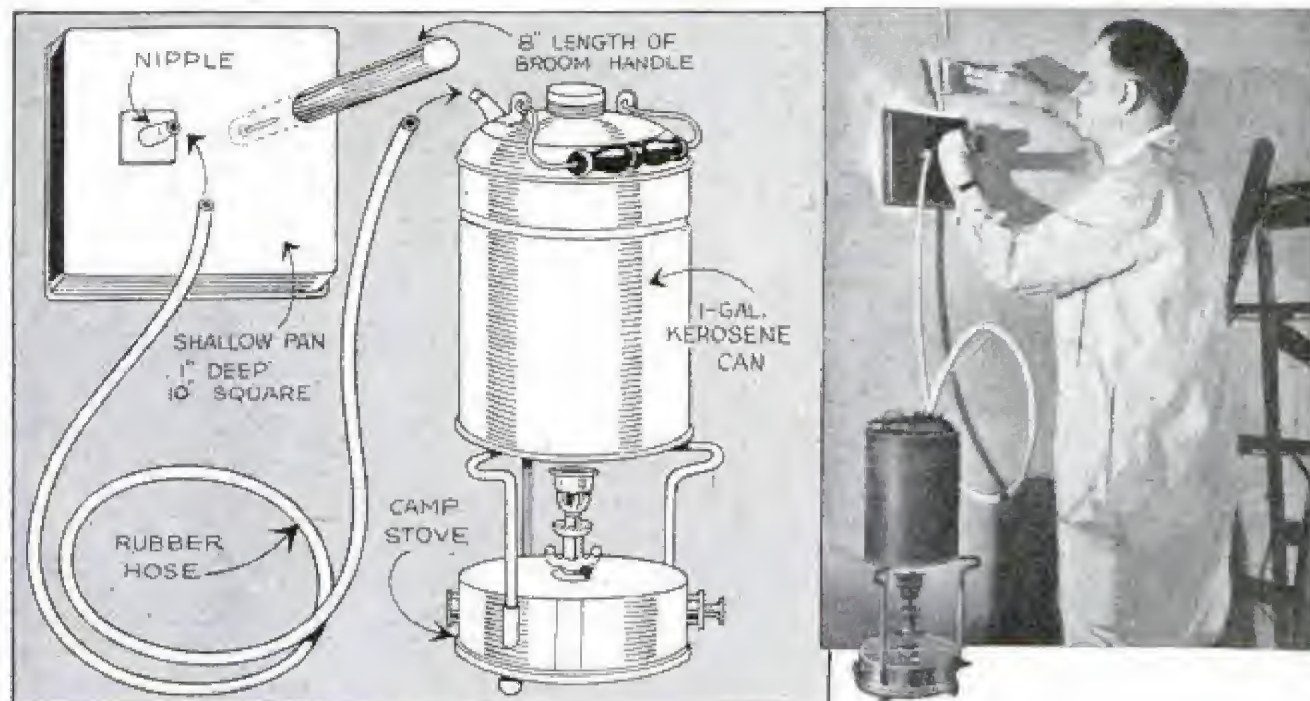
☞ A few drops of ammonia added to the soapy water in which oil mops are washed will not only clean the mop easier, but will cut the grease in the water.



Your boy and his friends will spend many happy hours running races if they have a couple of these inexpensive chariots



# Homemade Steamer to Remove Wallpaper

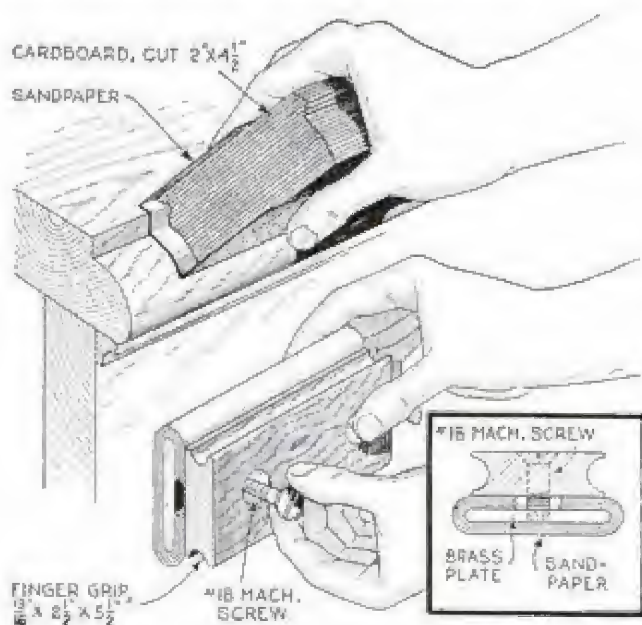


Quickly improvised at small cost, a steamer to loosen wallpaper works much better than soaking the paper with hot water. To concentrate the steam, use is made of a shallow cake tin to which a nipple and a wooden handle are attached. A length of rubber hose attaches to the nipple and to the spout of a small kerosene can. It will be well to get rubber hose that

fits the spout, which will then determine the size of the nipple on the pan. A small camp stove of any type is suitable for heating water in the can. The filler cap of the latter is screwed on tightly so that all the steam goes up the tubing. While the steam quickly loosens the dried paste, a putty knife is used to scrape off the paper.

—Wm. Sundvahl, Chicago.

## Contour Sanding Block Smooths Molding and Shaped Edges



*The two sanding suggestions illustrated will save time and enable you to do neater work*

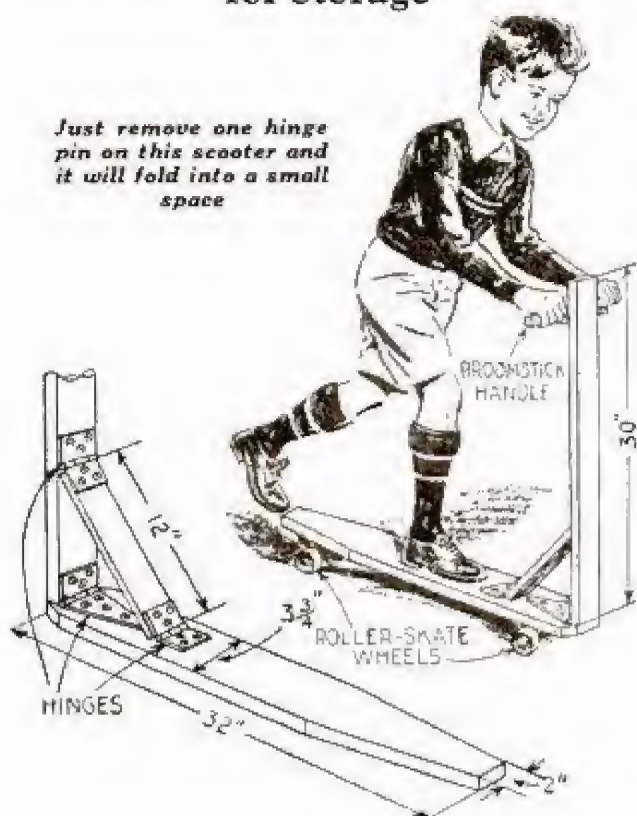
To get full benefit of sandpaper when smoothing irregular edges, use this contour sanding block. It consists of a number of pieces of cardboard of the size given in the drawing. The stack is held against the surface of the work at the desired angle and the cards are then pushed down to make contact with the wood. Then a piece of sandpaper is carefully fitted over the cards and you proceed with sanding. For holding a number of 4 1/4 by 5 1/2-in. sheets of sandpaper, the block shown in the lower detail is handy. This one is for flat surfaces and will be convenient for fluted work. The sandpaper is brought over the edges of a piece of metal, which is tapped for two screws that pass through the holder, the latter having concave edges to accommodate the worker's fingers.

—M. B. Birge, Hinsdale, Ill.



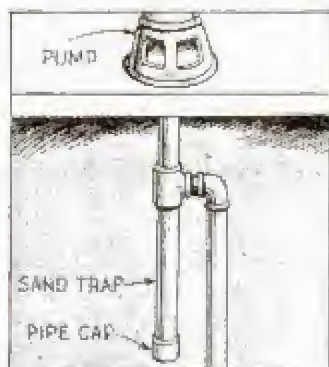
## Child's Scooter Folds Compactly for Storage

*Just remove one hinge pin on this scooter and it will fold into a small space*



Coasters and scooters often take up more space than the average apartment dweller is willing to sacrifice. Here is one that can be reduced to a small bulk in a jiffy so that it can be stored from one season to the next or squeezed into a small corner when not in use. The small hinge on the base is mounted so that it will fold back on itself, while the one on the upright should have the pin knocked out and a long slender bolt with a thumb screw substituted for easy dismantling. If the half of the large hinge which is screwed to the base is bent up slightly, the upright board will lie flat when the brace board is removed.

## Sand Trap Prevents Wear on Pump Valves

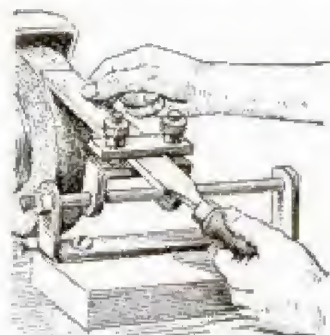


When a pump of the suction type is installed in a well or cistern in which there is much loose sand or small gravel, there may be additional wear on the valves which will neces-

sitate frequent repairs. Also, large pieces of grit may lodge under the valve so that the pump will not operate efficiently. To overcome this, one dealer installs such pumps with an offset pipe, connecting a pipe nipple with a screw cap at the end, just below the junction. This trap catches the sand or gravel that may be present in the water. The cap may be removed occasionally for cleaning.

## Sliding Tool Rest on Grinder

With this sliding tool rest, even the most unskilled worker can hollow-grind chisels and plane bits. The hinging action of the rest enables the operator to feed the tool to the stone gradually, thus minimizing generation of heat. The base and sliding toolholder are formed from metal of sufficient thickness to afford ample rigidity. The holes for the rod on which the holder slides are carefully laid out to assure alinement. The clamping screws are soldered to the hold-down piece so that they will not turn when the nuts are tightened.



—S. J. Gancher, Richmond Hill, N. Y.

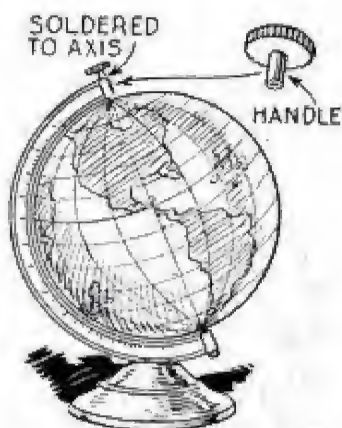
## Fertilizer for Potted Plants

To make plants thrive in pots or hotbeds, the soil should contain certain chemical foods, preferably in a form that can be concentrated in small pellets and put in the soil. To make the pellets, one of which is sufficient to keep the earth in a flower-pot of average size replenished for an entire season, mix and grind the following in a mortar, sodium phosphate, 1 oz., sodium nitrate, 1/2 oz., ammonium chloride, 100 grains, magnesium oxide, 25 grains and slaked lime (powdered), 1 1/2 oz. Soak sheet gelatin in cold water and, when swollen, remove it from the water and heat in a dish until it melts. The gelatin is added to the compound in sufficient quantity to make a thick paste, which can be rolled into pellets about the size of peas in the palm of the hand. To use the pellets, drop



one in a hole made in the earth of each pot with a pencil. Two or three of them should be used in hotbeds containing larger quantities of dirt. The pellets do not disintegrate when water is added to the soil, but swell and release the chemicals in minute quantities as required.

### Turning Cap on Axis of Globe Protects Surface



If you rotate a world globe by placing your hand on it, the surface will soon become soiled. To avoid this, get a small metal knob and solder it to the end of the globe axis. With this, you can twirl the globe with the fingers.

### Shellacking Your Golf Clubs

No matter how careful you are with your golf clubs, the shafts are likely to rub together in the bag so that the varnish is worn through in spots. This will let moisture penetrate the wood shafts, which are likely to warp when they are stored over the winter months. To minimize such damage, it's best to provide a protective coating of clear shellac after sanding down the shafts with very fine paper.



*Sand and shellac wood shafts of your golf clubs each fall to prevent moisture from warping them*

### Sanding Disks Attached to Plates with Powdered Rosin

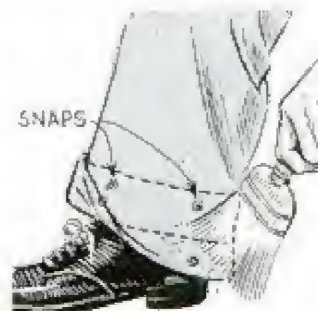


*Hot iron applied to abrasive paper melts rosin, which sticks paper to sanding disk*

To attach a sanding disk to the metal plate quickly and securely, remove the plate from the machine, mount it on a bolt or stud in the vise, and sprinkle powdered rosin over its surface. Place the disk of abrasive paper on the plate, in the position required, and smooth it with a hot flat iron, using a piece of cardboard between the iron and the sandpaper. The heat will melt the rosin so that the paper will adhere.

### Trouser Cuffs Are Easy to Clean When Held by Snap Fasteners

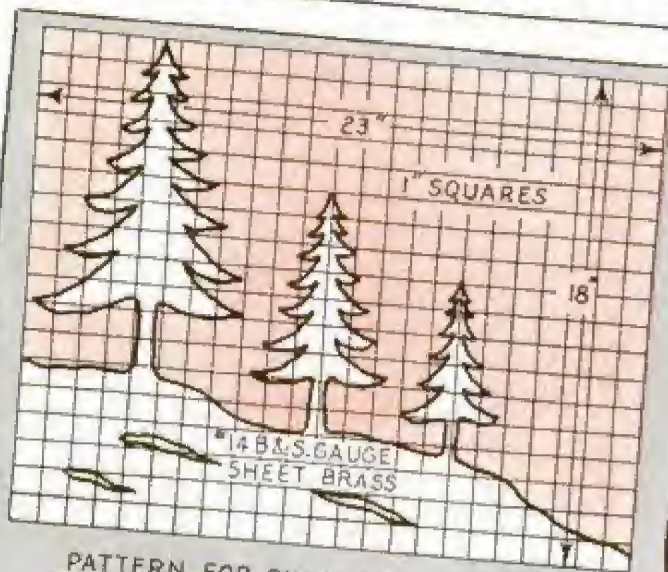
Have you ever been annoyed when removing dirt from the cuffs of your trousers because they were tacked in place by thread, which made it difficult to turn them down? If so, substitute snap fasteners for the thread. Then you can turn down the cuffs and clean them out with a whisk broom in a jiffy. The fasteners are sewed inside the cuffs so that they are not visible when the latter are turned up.



—Gilbert H. Marks, Chicago.

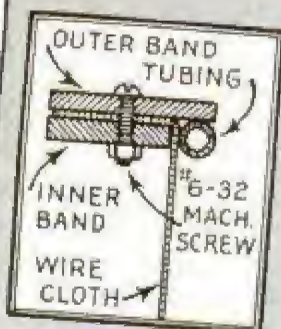


# Brass FIREPLACE SCREEN

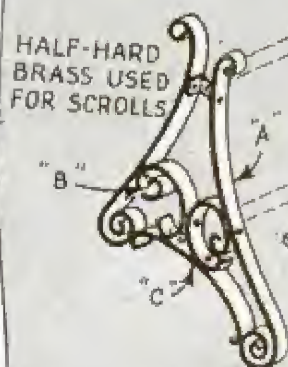


PATTERN FOR PINE TREE CUT-OUT

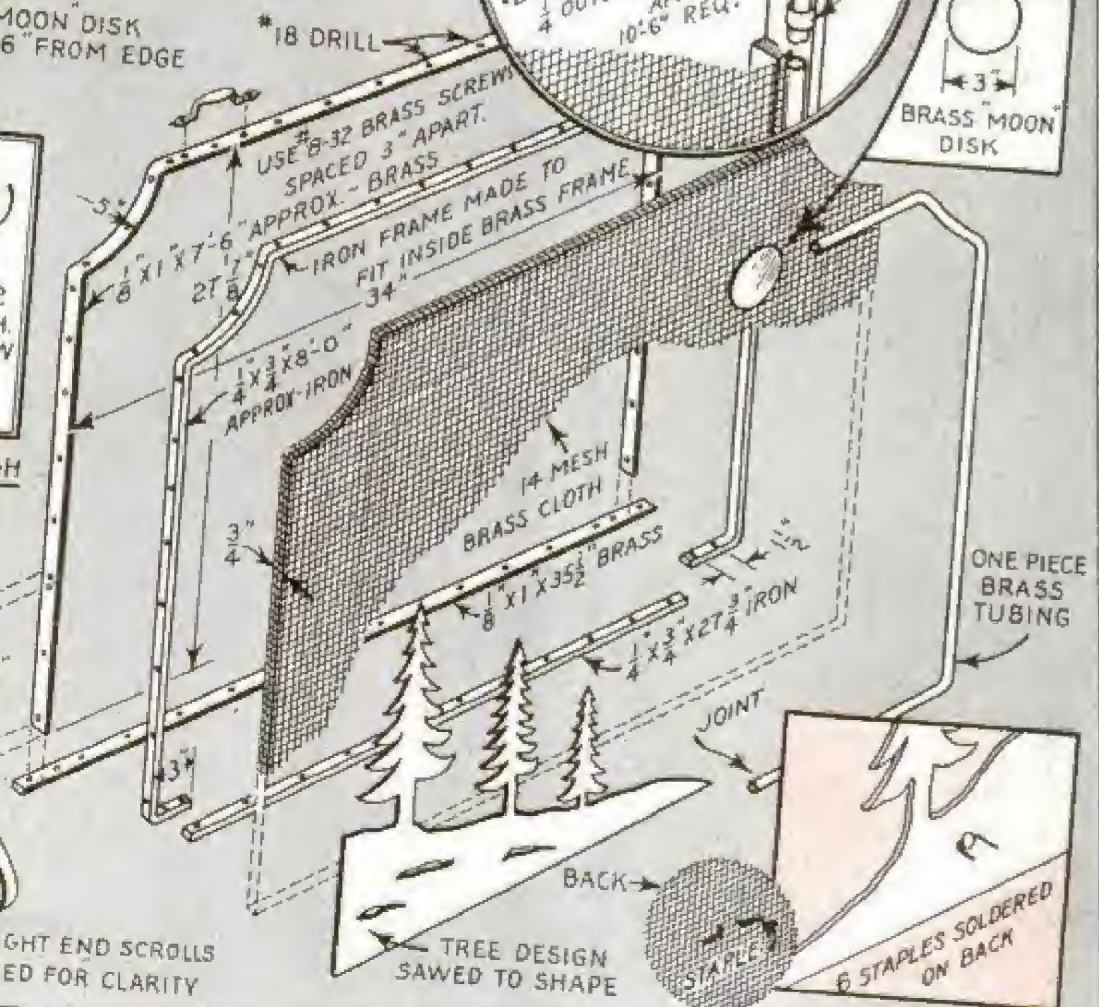
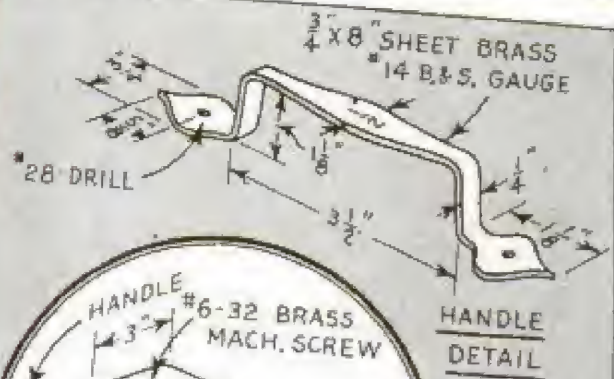
NOTE - PLACE "MOON" DISK  
5" FROM TOP & 6" FROM EDGE



SECTION THROUGH  
FRAME



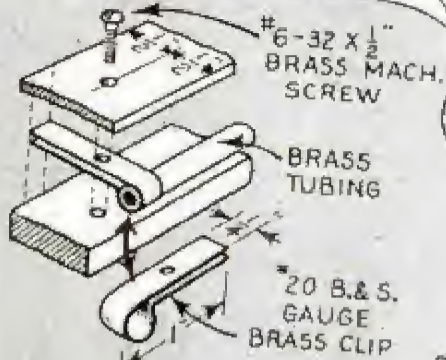
NOTE - RIGHT END SCROLLS  
OMITTED FOR CLARITY



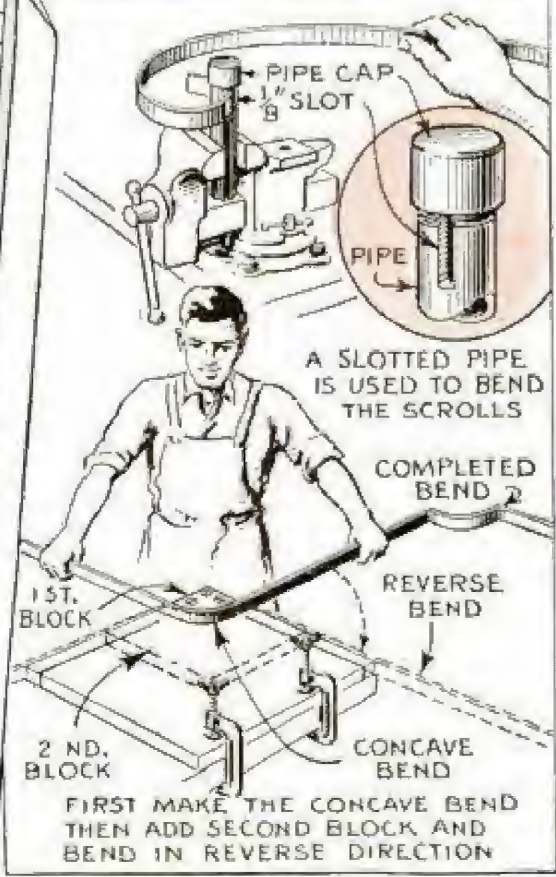
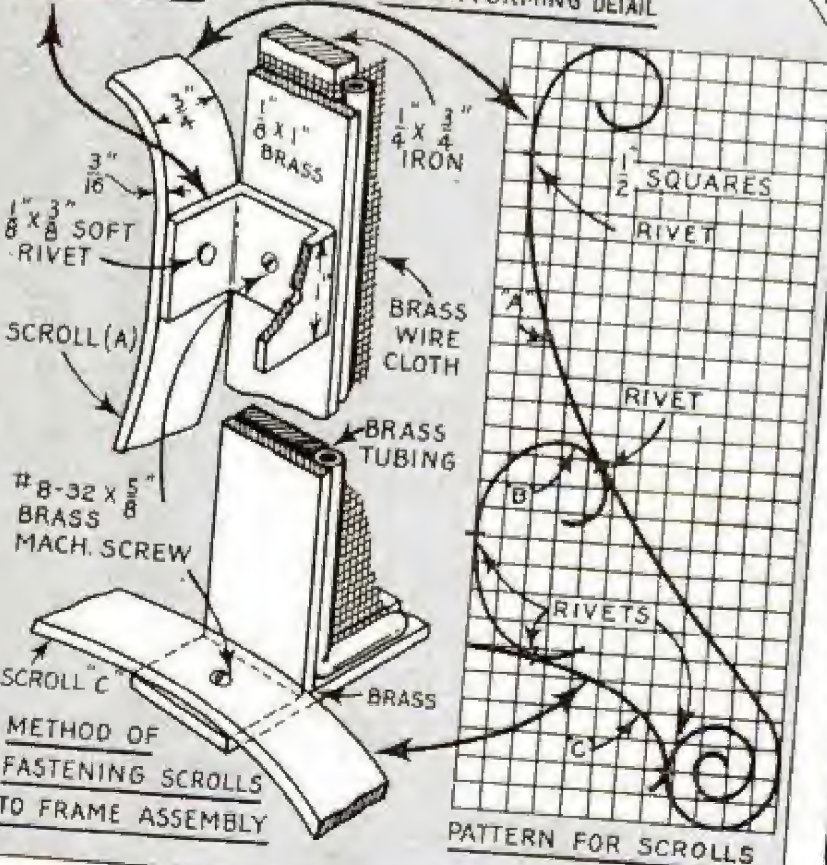
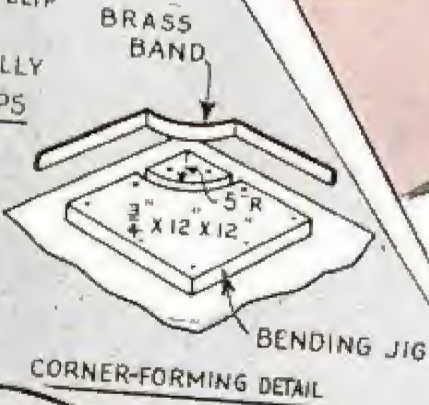
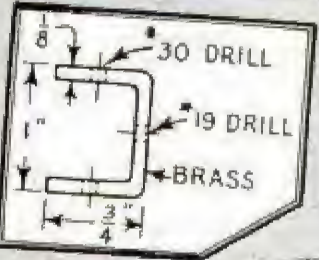
The rich sheen of polished brass is always ornamental and in a fireplace screen it is especially effective. All exposed parts of this one are made of brass in stock sizes. Bend the two frames, clamp them together and drill for machine screws. Then remove the clamps and fit the wire cloth, cut-outs and scrolls



# has pine-tree motif



22 CLIPS SPACED EQUALLY  
DETAIL OF TUBING CLIPS





## Flower Urns from Auto Lamps Attached to Porch Columns



*Screwed to porch columns or side of house, bracket-type headlamps provide excellent flower urns*

Old auto-headlamp shells provide neat flower urns for porch columns or the sides of a house, and there's nothing to make; just screw them in place. They may be salvaged from almost any scrap heap, and when painted, they form attractive urns.

## Penetrating Oil Works Rapidly with Soldering Iron



When penetrating oil is employed to loosen a screw or nut, its effect can be obtained quickly by applying a hot soldering iron to the work. The combination of the heated oil with the expansion and contraction of the metal does the trick.

## Rhubarb Grown in Basement During Winter Months

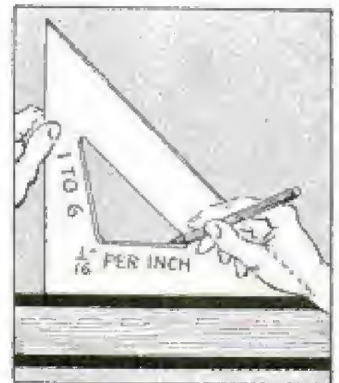
A New Mexico farmer tells of having fresh rhubarb all winter by growing it in his basement. Healthy plants that are several years old are selected late in the fall. After these plants have been allowed to

freeze, they are packed together closely in good, loose soil, which is kept soaked with water, and then moved to a dark cellar where a temperature of about 60° F. is maintained. Within a few weeks there will be large, pink stalks with small, white leaves. Sunlight is not admitted as it causes leaves to develop and become green while the stalks become long and spindly. With the coming of spring, the plants are put back in the garden. The same ones should not be forced in the cellar again for several years.

## Draftsman's Triangle Altered to Draw Beams and Threads

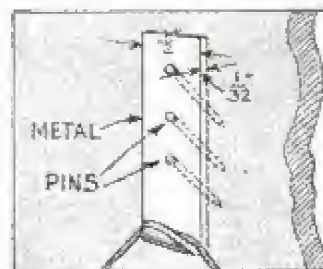
I find that a celluloid triangle altered as indicated, is very helpful in my drafting work. One edge of the opening in the center of the triangle is tapered 1 to 6, which is the standard slope of structural I-beams and channels. The other edge is sloped  $\frac{1}{16}$  in. per inch, which is the same as the taper of American standard pipe threads.

—Max Gaber, Cleveland, Ohio.



## Pictures Hung on Wallboard with Special Hook

Here is a hook that will come in handy for hanging heavy pictures on walls covered with soft-pressed board. It consists merely of a thin strip of metal about  $\frac{1}{2}$  in. wide, which has three or four holes drilled through it to take regular bank pins at an angle as indicated. The holes should be small enough so that the heads of the pins will not pull through them.



☞ Rub paraffin on the legs of a wood camera tripod and it will open and close easily.



# Imitation Wrought-Iron Hinges of Sheet Lead



Imitation hinges on soft-pine colonial doors, straps for chests, keyhole plates, etc., can be cut from sheet lead for a few cents each. The handmade effect can be produced by hammering with a ball-peen hammer. To assure that both halves of each hinge will be exactly the same in contour, you draw a design of only one half as shown in Fig. 1. Fold the paper along the centerline and cut out the design of both edges at once, after which the template thus formed is traced directly on a sheet of lead  $\frac{1}{16}$  in. thick, as in Fig. 2. However, before this can be done the lead should be flattened by means of a block of wood and a hammer as in Fig. 3. Next, cut out the design from the lead, with a jigsaw or with a pair of tinners' snips. Rough edges can be dressed with a small file. In hammering the metal as in Fig. 4, which is the next step, tap lightly to avoid distortion of the piece. As the lead is rather thick, it is advisable to countersink the screw holes as in Fig. 5, if ordinary flat-head wood screws are to be used for attachment. Don't drive the screws too tightly or the lead will "ooze" out around the edges of the screw heads. Then comes the finishing as in Fig. 6. It will be found that an age-old, antique effect can be simulated by the use of black eggshell enamel. Then the hinge will look exactly like an iron one with such a covering.

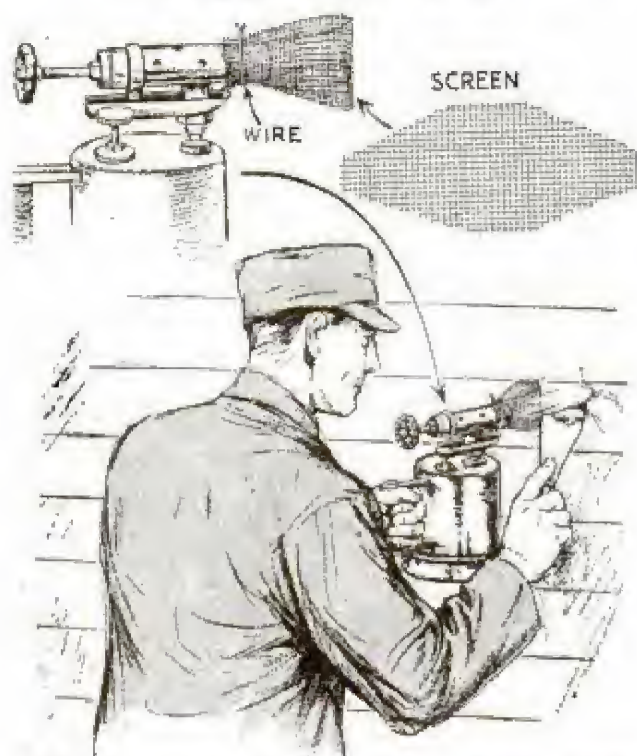
—J. P. Driscoll, Buffalo, N. Y.

☛ To keep moss from growing on a roof, place a zinc strip so that rainwater will run over it; no moss will grow on the roof below the strip for a distance of several feet.





## Screen-Wire Baffle on Blowtorch to Burn Off Paint

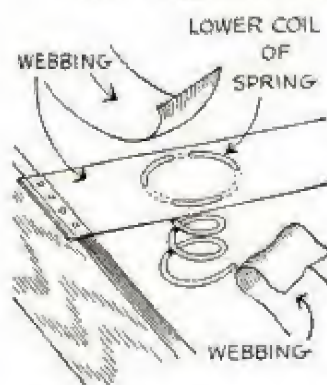


*Baffle of screen wire spreads flame evenly against painted surface to avoid deep burning in spots*

When a blowtorch is employed to burn paint from wood surfaces, it is difficult to regulate the flame so that it will spread evenly against the paint to avoid deep burning at any one place. If a piece of screen wire is attached to the nozzle of the torch by means of stout wires, as shown in the illustration, it will aid in spreading the flame to the best working angle and help prevent burning the wood.

—G. E. Hendrickson, Argyle, Wis.

## Anchoring Springs to Webbing on Upholstered Furniture



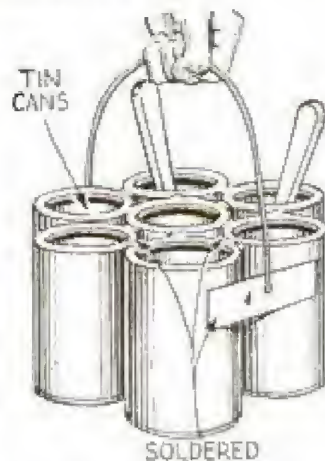
Instead of sewing springs to webbing of upholstered furniture, one worker follows a method that not only saves time, but also prevents the springs from loosening at the bottom. When

spaced properly, the lower coil of each spring is worked in and out through the webbing strip as shown. Then, after all

springs have been fastened in this manner, strips of webbing are stretched over them at right angles for additional support.

## This Multiple Paint Bucket Holds Several Colors

Persons who have to maintain signs or touch up paint jobs will find this multi-color paint pail convenient. The pail consists of several small cans soldered together at their rims. Strips of tin punched in their centers to take a bail are soldered to opposite sides. The bail is a piece of heavy wire.



## Tennis Nets Given Even Tension by Old Auto Springs

It's a simple matter to keep an even tension on tennis nets by using old auto springs as indicated. These are bolted to the outer surface of the supporting posts



*Tennis nets fastened to old auto springs are easily kept under constant tension*

with small iron rods leading from the eyes through holes in the posts to a vertical iron rod which is fastened to the end of the net.



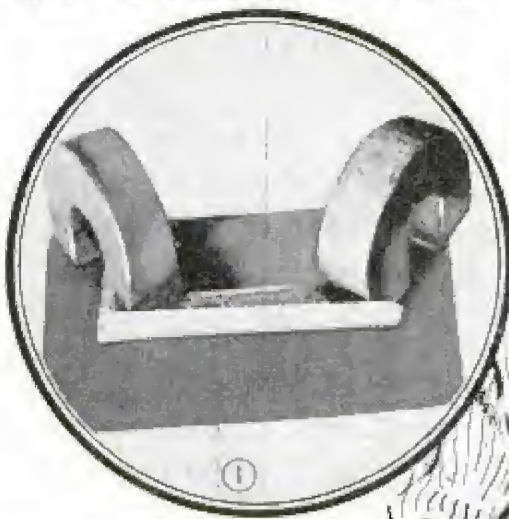
1121 S. Hill St  
 Los Angeles.

# What You Can Do with the NEW MAGNETS

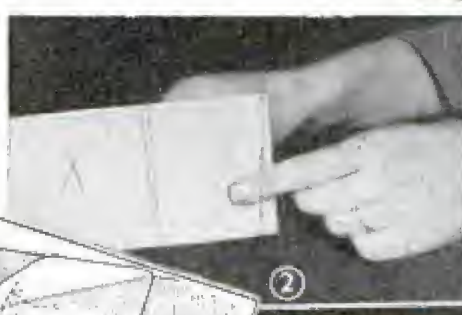
By J. P. DRISCOLL

NEW, powerful permanent magnets made of an aluminum-nickel-cobalt alloy, capable of lifting iron and steel objects many times their own weight, have many practical uses around the home, shop and office, and provide a new field for the amateur magician.

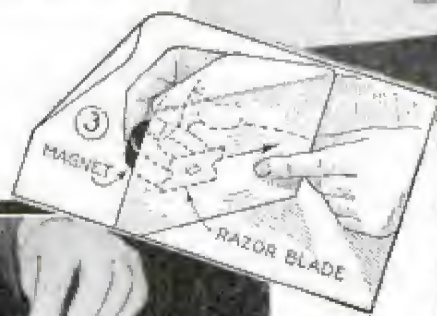
In Fig. 1, two magnets serve as clamps to hold small sheet-metal work in position for soldering, leaving both hands of the worker free. In Fig. 5, a little magnet draws tiny chips of metal away from the drill on a drill press as fast as they are released. Another shop use, Fig. 6, is to hold small, stubby machine screws of steel. By touching a magnet against the shank of the screw-



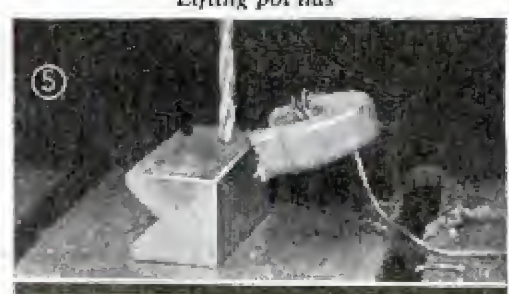
Clamping work when soldering



Mobile razor blade



Lifting pot lids



Removing drill chips

driver, the screw will adhere to the end, and you can then bring it into the tapped hole on the work. In the same way, the loss of small screws can be avoided when dismantling models and small pieces of machinery.

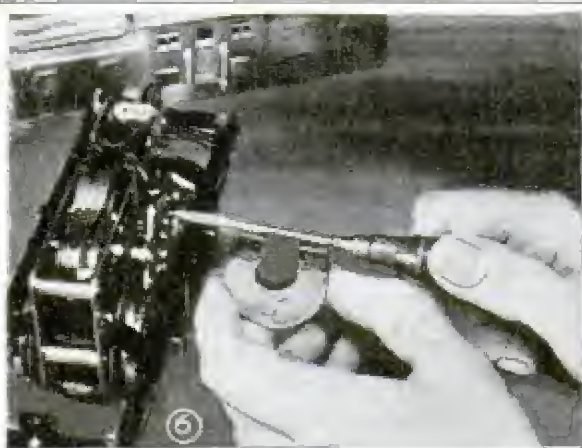
One of these magnets kept handy near the kitchen stove, serves as a lifter for hot pot lids of steel, as in Fig. 4. Although a vacuum cleaner will pick up small metal objects such as tacks, needles and hairpins from rugs having very little pile, the practice of doing this is not recommended because of the possible damage to the cleaner. So it's a good idea to follow the suggestion shown in Fig. 16. A few of the magnets are attached to a strip of wood, with the pole faces all lined up along one edge. Then the strip is fastened to the front of the cleaner with rubber bands. This enables you to extract pins from rugs having a thick pile. The ability of magnets to hold many small steel objects also can be utilized by the hairdresser, who must have her hairpins where she can grasp them with one hand while she holds hair in position with the other. A strip of cloth tied to

Standard sizes. Central Scientific Co. 1900 Claring Park Blvd

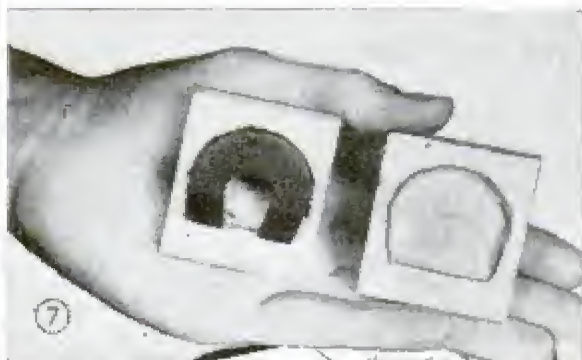
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Special sizes or shapes, Indium Steel Products, C. Valhalla

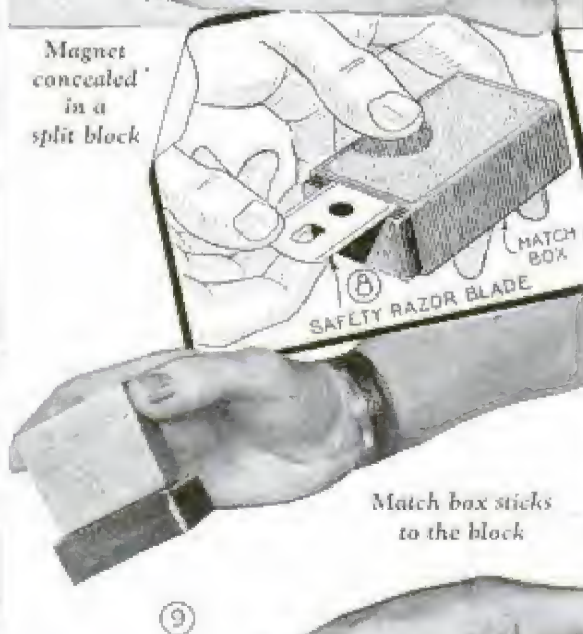




Magnet helps to place small screws



Magnet concealed in a split block



Match box sticks to the block

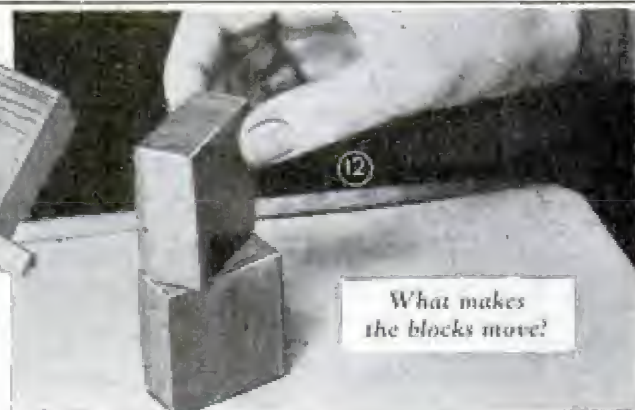
a magnet and pinned to the dress will provide a place where the hairpins will always be at hand. A similar arrangement of value to the office worker, for the purpose of holding paper clips, is shown in Fig. 15. In this case the magnet is conveniently mounted on a block of wood which is set on the desk.

And now for a few suggestions to mystify your friends. Figs. 2 and 3 show a simple stunt which is done with a safety-razor blade and an ordinary envelope—and, of course, a small magnet. You request someone in the audience to place the razor blade in the envelope and seal the latter after marking with a pencil the side in which the blade was put. The performer claims that he can, by moving his finger on the outside of the envelope, make the blade travel from one side to the other. The envelope is held in a vertical position but is not tipped to make the blade slide inside. It is best to have the envelope up in a crack between the leaves of a dining-room table, so you don't have to handle it. Then, with a small magnet in one hand behind the envelope, and the finger of the other hand in front of it, you perform the trick, deftly keeping the magnet from view of the spectators.

Another puzzler is the magnetic block of wood. Here a real magnet is concealed inside of a split block, which is carefully glued together. Use a hardwood block, such as maple or walnut, as the additional weight of one of these small magnets, after removing some of the wood to accommodate it, will not cause the block to be noticeably heavier than if it were all wood. Fig. 7 shows the block before gluing. Now, if you slip a safety-razor blade between the cover and inside of a small match box as in Fig. 8, where it will



Magnetic cigarette





be concealed even upon rather close inspection, you can cause a wood block to lift a match box as in Fig. 9. By slipping a large needle into a cigarette, you can also make the latter cling to the block, Figs. 10 and 11. Then, a second block with a piece of iron concealed inside, can be drawn over a smooth surface as in Fig. 12. Or, it can be perched on the magnetic block as in Fig. 17, seemingly defying the law of gravity. A few dummy blocks without magnets should be offered to spectators in order to add to the deception. In this case there should be some slight mark to identify the real magnet block so that the performer can pick it out instantly, but such a mark should not be apparent to the spectators.

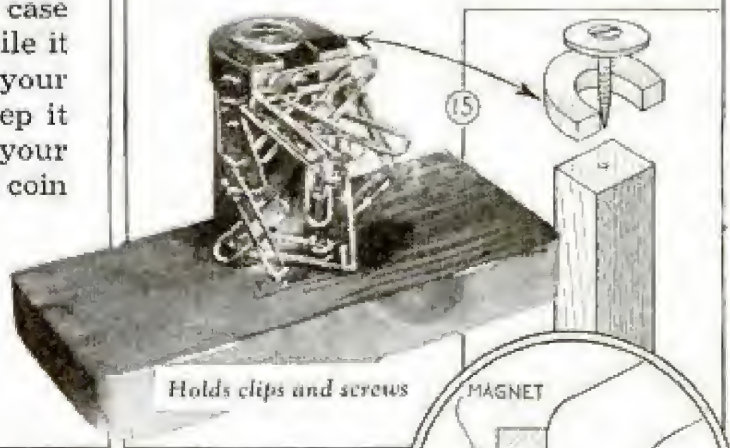
A little juggling feat is shown in Fig. 13. Of the two tin cans used, the top of one has been removed carefully and soldered back in place. Before this was done, however, two magnets were attached to a rod inside with their pole faces lined up. The pole faces should be close to the edge of the can but they should not touch it. If the lower can is placed in a position where it cannot roll, it will be found possible to balance the upper can, when the magnets are brought to the proper position where they can exert their pull on the lower can. A new version of the disappearing coin trick is shown in Fig. 14, only in this case an iron "coin" or washer is used. While it is usually easy to snap a coin up your sleeve, it is not always so easy to keep it there. But if a small magnet is tied to your arm a little way above the wrist, the coin will stick to it and cannot be dislodged from the sleeve even with the most violent shaking. The performer can first convince the guests that no rubber band is used to pull up the coin.



The balancing cans



The vanishing "coin"

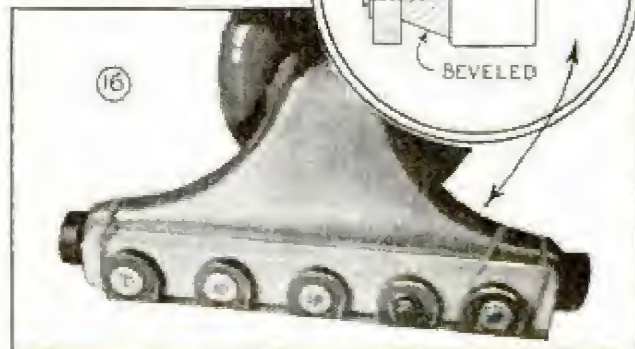


Holds clips and screws

Finding lost needles



Wood blocks defy gravity





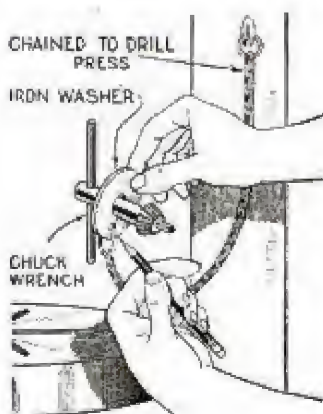
## High Poles Are Easy to Climb • With These Rope Loops



*You can climb a high pole or mast safely by using large loops of soft, flexible rope*

Any mast or flagpole can be climbed by using two rope slings as indicated. The rope should be strong and pliable, and the sling should be large enough to loop about the pole. In use, place one foot in the lower one. Then throw your weight on this one, hang to the pole with one hand and raise the other loop as high as you can reach with the free foot. With your foot in this loop and your weight on it, change hands on the pole, slide the lower loop up with your foot until it is just below the other, throw your weight on it and then move up the other loop. Continue this procedure until you reach the top.

## Chuck Wrench Fastened to Frame of Drill Press



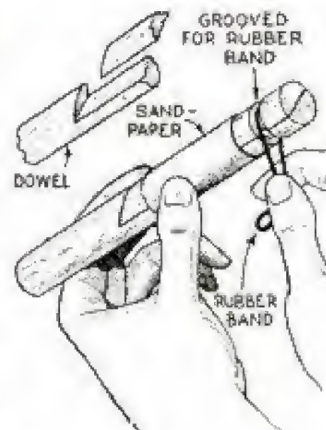
Instead of just tying your chuck wrench to a drill press with a chain or string, which usually tangles when turning the wrench, try slipping a washer over the wrench and tying the chain or string to it. This

allows the wrench to be turned without twisting or tangling the cord. The handle of the wrench can be removed to slip the washer over the shank.

—Waller Kaufmann, Santa Monica, Calif.

## Sanding Stick for Scroll Work

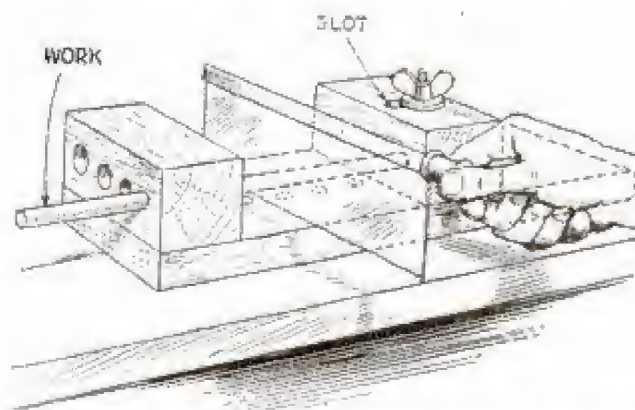
Make up a number of these sticks of various diameters and you can do any sanding job on scroll work with little trouble. The sticks are dowel rods sawed lengthwise through the center about half their length, after which one half is sawed off at a slant as indicated. This slanting cut holds the free piece of the stick as it is pushed into place with the end of the abrasive paper under it, and tends to wedge it tightly against the paper. A rubber band in a groove holds the other end.



—S. J. Gancher, Richmond Hill, N. Y.

## Dowel-Cutting Jig Saves Time on Quantity Production

When a number of duplicate dowels are required, this simple jig will enable you to do the work quickly by hand. It consists of a base on which two wooden blocks are mounted. The fixed block has three or four holes for different size dowels while the tailstock or removable block has one hole to receive the ends of the dowels and



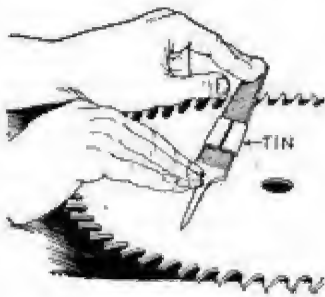
*This gauge eliminates guesswork when cutting a number of dowels to duplicate lengths*



is held in place by a bolt and wing nut which works in a slot. Several holes drilled through the base permit this block to be adjusted roughly and the slot in the block allows it to be adjusted finely.

### Gauge on File to True Saw Teeth

I always had trouble in truing up the teeth of a saw after filing them, until I hit on the idea of using a thickness gauge on the file to space it the correct distance from the surface of the saw blade. The gauge is just a piece of tin 3 or 4 in. wide, folded over the file as indicated. In use, the file is held

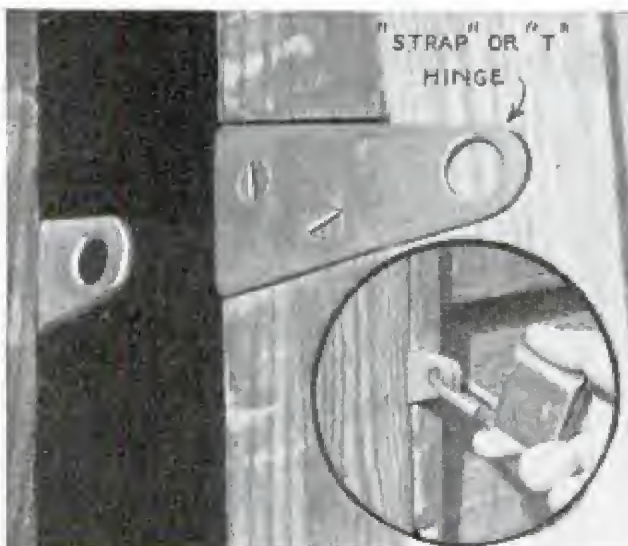


flat against the saw blade and passed over the edges of the teeth until enough metal is removed so that the file doesn't touch them. I use a thin piece of tin for small saws, increasing its thickness according to the size of the saw.

—Luther Strosnider, Havensville, Kan.

### Strap Hinge Forms Hasp to Take Padlock

The next time you need a padlock hasp and none is available, hunt up an old strap hinge, remove the pin and drill holes near the ends of the two halves to take the lock shackle. Screw one half of the hinge to the edge of the door and the other to the frame.



Two halves of a hinge drilled at the ends to take a padlock shackle provide a good lock hasp

### Modern Salt and Pepper Shakers of Wood and Metal



These little walnut shakers with their chromium-plated cups show up nicely on a white tablecloth

Here are salt and pepper shakers that anyone can make in a little while. All you need is a couple of small walnut blocks and two small chromium-plated cups. First turn the blocks to ball shapes with flat ends, and drill a hole almost through each one. Then perforate the bottoms of the cups with the letter "S" for salt and the letter "P" for pepper and insert them into the holes in the walls, allowing them to project out of the hole about  $\frac{1}{4}$  inch.

—John T. Bailey, Bloomfield, N. J.

### Duster from Paintbrush

If you have some old paintbrushes lying around in which the bristles are full of dry paint so that they are useless, it is a simple matter to convert them into efficient dusters. Just take a sharp pocketknife and insert the end of the blade through the bristles at intervals near the ferrule. This will cut out many of the bristles and those remaining can be softened by a chemical paintbrush cleaner so that they will be pliable enough to provide a duster.—Fred Szabo, Corona, Calif.





# The Latest WALL

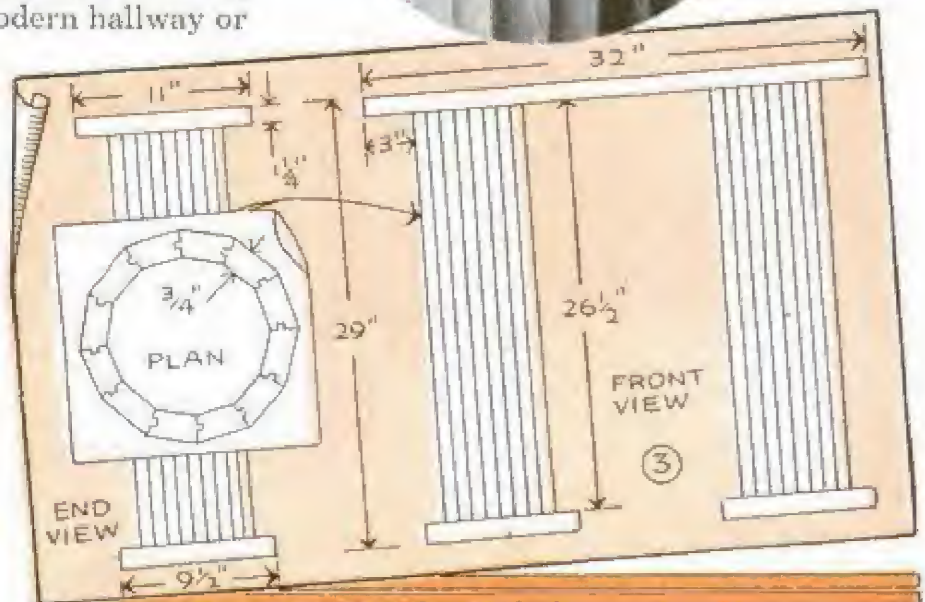


ranged as detailed in the insert of Fig. 3. The segments are cut from  $\frac{3}{4}$ -in. stock. The outside face should measure  $1\frac{1}{2}$  in. across when finished, the edges being cut at a 15-degree angle as shown in Fig. 8. After all the segments have been cut, they are assembled with glue by coating the work and sliding the joints together as shown in Fig. 7. This will be found the most convenient method because difficulty may be encountered in matching the joints if the strips are warped. Also, the rubbing action will tend to bring the joints together firmly, which will make it unnecessary to clamp the assembly provided, of course, that the segments have been accurately cut. Naturally a circular saw is required for this purpose. After the glue has dried thoroughly, the columns are fluted. This is done with a molding head

By WAYNE C. LECKEY

**O**FFERING smart treatment to bare walls and corners, these wall tables, finished in contrasting colors of bone white and walnut or black, will lend a striking, decorative touch to the modern hallway or living room.

The table, shown in Fig. 1 and dimensioned in Fig. 3, has pleasing, classic lines. The construction is centered mainly around two fluted or reeded supporting columns. For the sake of simplicity these may be made following two methods. First, they may be built up in cylindrical form from twelve tongue-and-groove segments ar-

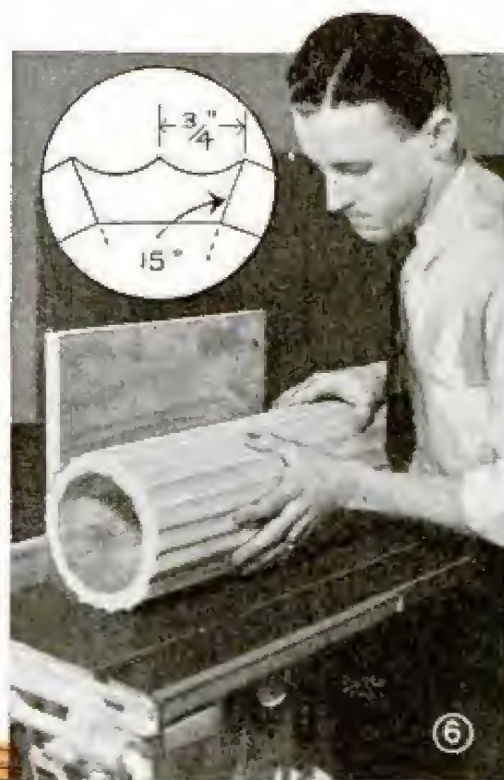
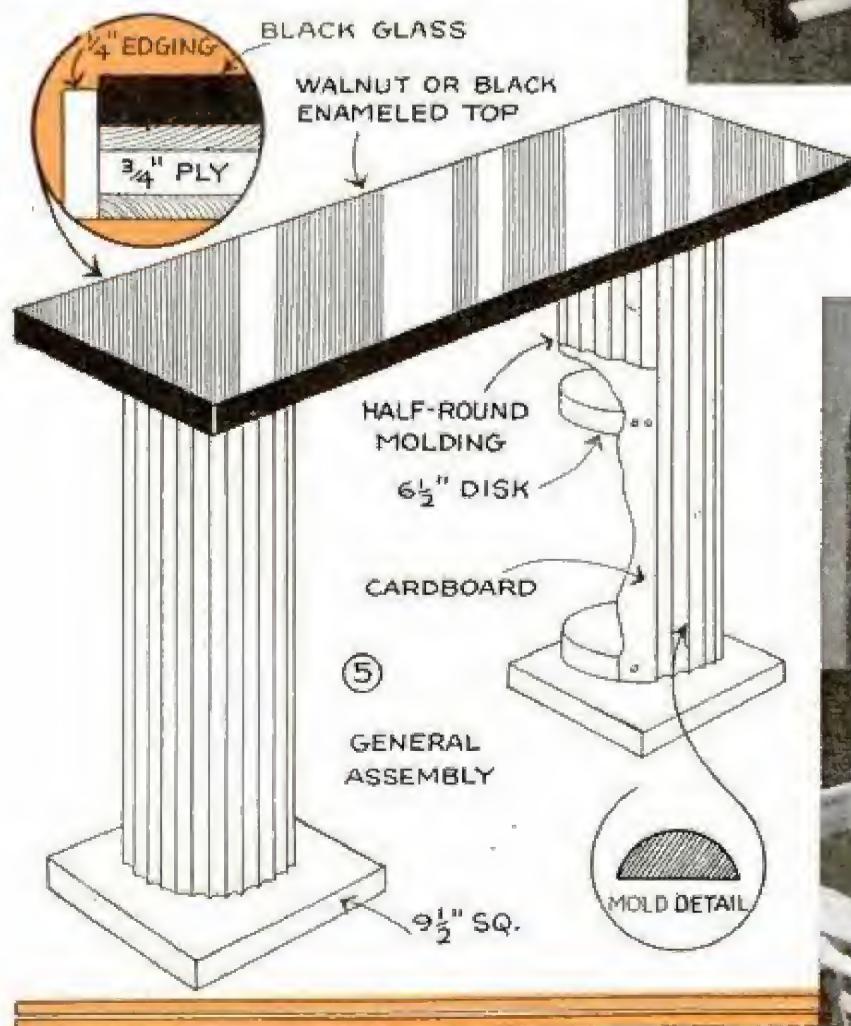




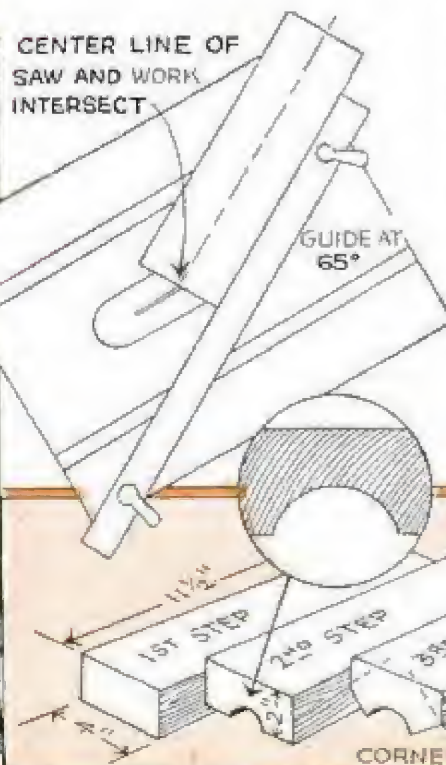
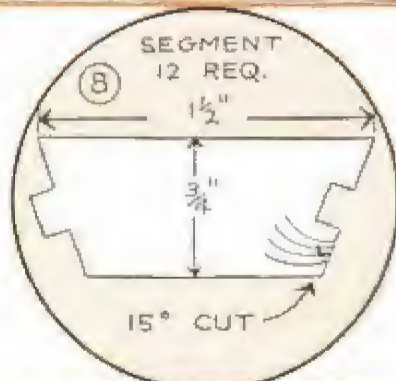
# TABLES

on the circular saw as shown in Fig. 6. Each segment has two cuts  $\frac{3}{4}$  in. wide, as shown in the detail above the photo. In making these cuts, one must be very careful to avoid any lateral shift or "roll" of the column as this would cause a wavy cut, and thus ruin the work. The arrangement of a little improvised jig to prevent such roll may be advisable if you have any misgivings about doing this. Such a jig is also shown in the photo, it being attached to the ripping fence of the saw. A narrow strip of wood, temporarily tacked to the column, can be used to slide on a similar strip on the jig, in order to assure straight, true cuts. Of course, the strips will have to be shifted for each cut. When fluted, the columns will have the appearance of being round.

Where lack of motorized equipment makes it impossible for you to follow this







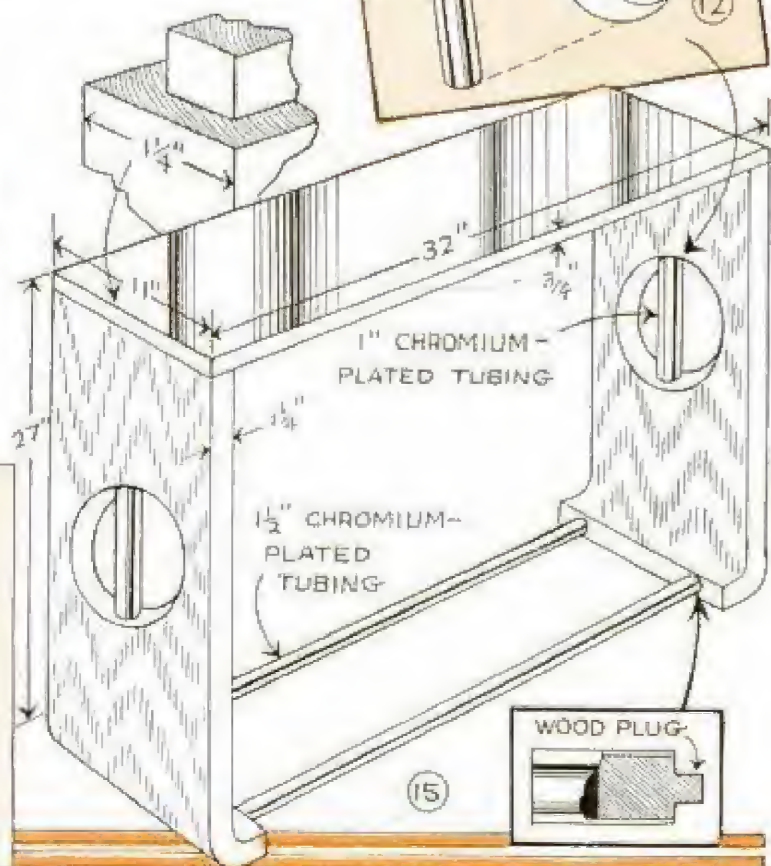
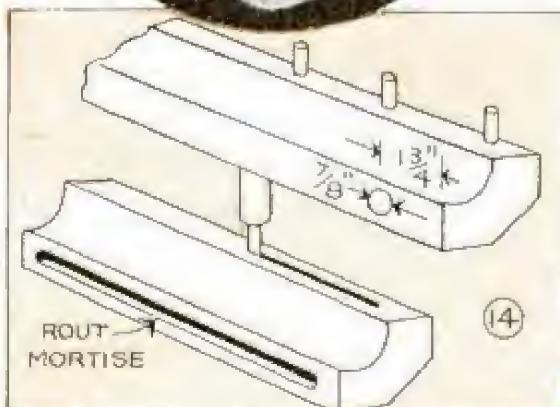
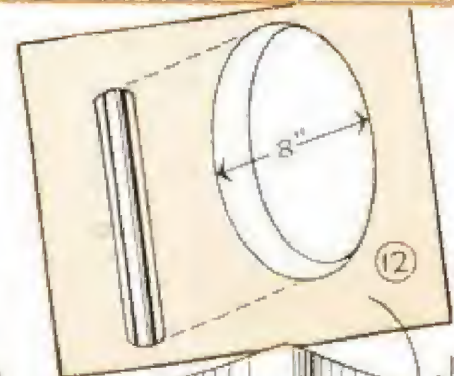
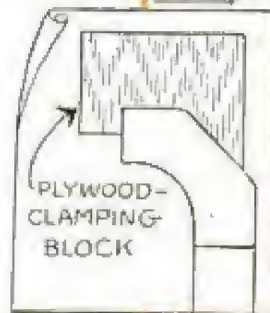
method of cutting the flutes, and you have to do this ornamentation by hand, a reeded effect is obtained by nailing strips of molding to wooden disks as shown. These are cut  $6\frac{1}{2}$  in. in diameter and they are first encircled with a piece of cardboard, which is tacked to their edges to form a cylinder. Then the forms are covered with standard half-round molding, nailing the strips side by side around the entire circumference. See Fig. 5. If the spacing should not work out exact, the irregularity may be placed at the back of the column. While the former method gives a fluted appearance, the reeded effect formed by the half-round molding will, if heavily painted, be equally attractive.

And now for the top of the table. You can produce a stunning effect by using clear plate glass over a  $\frac{3}{4}$ -in. plywood panel which has been enameled black smoothly and striped with a narrow gold border about an inch from the edge. Or, you can enamel the underside of the glass to obtain practically the same effect. A thin banding of wood or chromium-plated trim, mitered and nailed around the edge of the top as shown in the circular insert of Fig. 5, will keep the glass in place. If desired, sheet plastic or Carrara glass may be substituted for the clear plate glass. For economy, a plain enameled or varnish finish may be given to a top made to resemble a thick walnut plank by nailing  $\frac{1}{4}$  by  $1\frac{1}{4}$ -in. facing strips around the edge of a center piece of  $\frac{3}{4}$ -in. thick stock. Assembly of the top to the columns is made with four  $\frac{1}{2}$ -in. dowels spaced as shown at Fig. 2. The lower bases which are about  $9\frac{1}{2}$  in. square should be at least as thick as the top, or even a little thicker. These may be attached to the columns with glue and long wood screws.

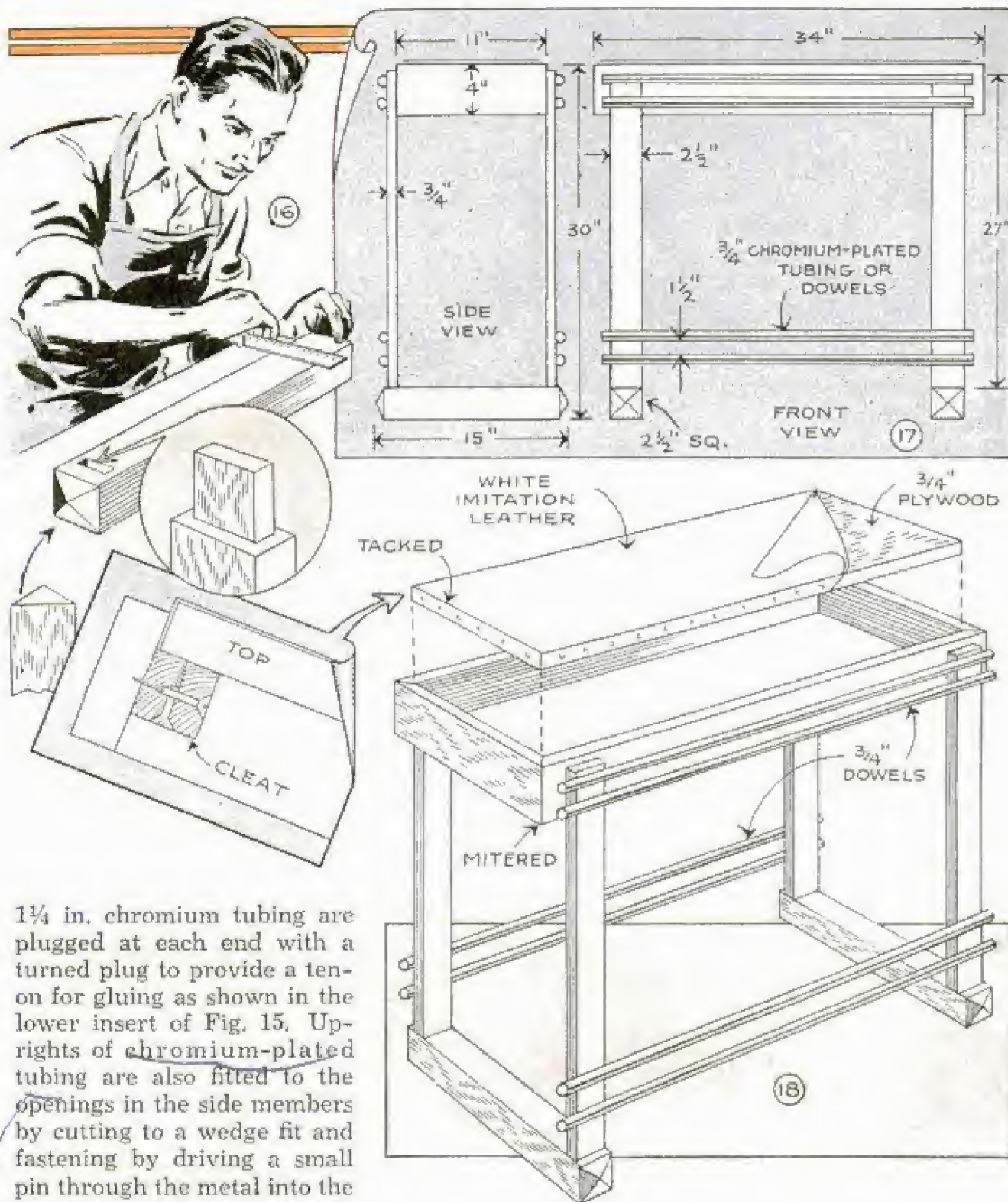
Somewhat easier to construct is the table shown in Fig. 4. All dimensions are given in Fig. 15. For an enameled finish, you can use poplar or white pine. The curved pieces at the lower ends of the sides are formed by adding separate blocks which



are partly cut before being glued on. Fig. 10 details the successive steps in cutting these and, since only two are required, both may be cut as one piece, later cutting in two. The first step is to prepare a block to measure approximately 23 in. long, 4 in. wide and  $1\frac{1}{2}$  in. thick. Next, the cove is cut as shown in Fig. 9. This is done on the circular saw by clamping a wood fence diagonally across the table at a 65-degree angle in a position to allow the centerline of both saw and work to intersect. The block to be cut is then slowly passed repeatedly over the blade, lowering the table slightly after each pass and taking very light cuts until the correct depth is reached. The corners adjacent to the cove are now cut back 45 degrees to form the plumb cuts for joining to the end members. Finally the waste is removed by inverting the work and cutting the top corners off. Before gluing the blocks in place, it is well to first cut the circular openings in the sides of the table, Fig. 12, and also the tenon joint at the top. The corner blocks may be attached with either a mortise routed on the drill press as shown in Fig. 14 or with dowels as in Fig. 13. Several clamping blocks of  $\frac{3}{4}$ -in. plywood are required as shown in the detail of Fig. 11, to provide a surface for applying the clamps which are used as indicated in Fig. 11. When the glue has dried, the outside contour of the blocks is roughly brought down to shape with a hand plane and smoothed flush at the joint with the face of the sides. Stretchers of







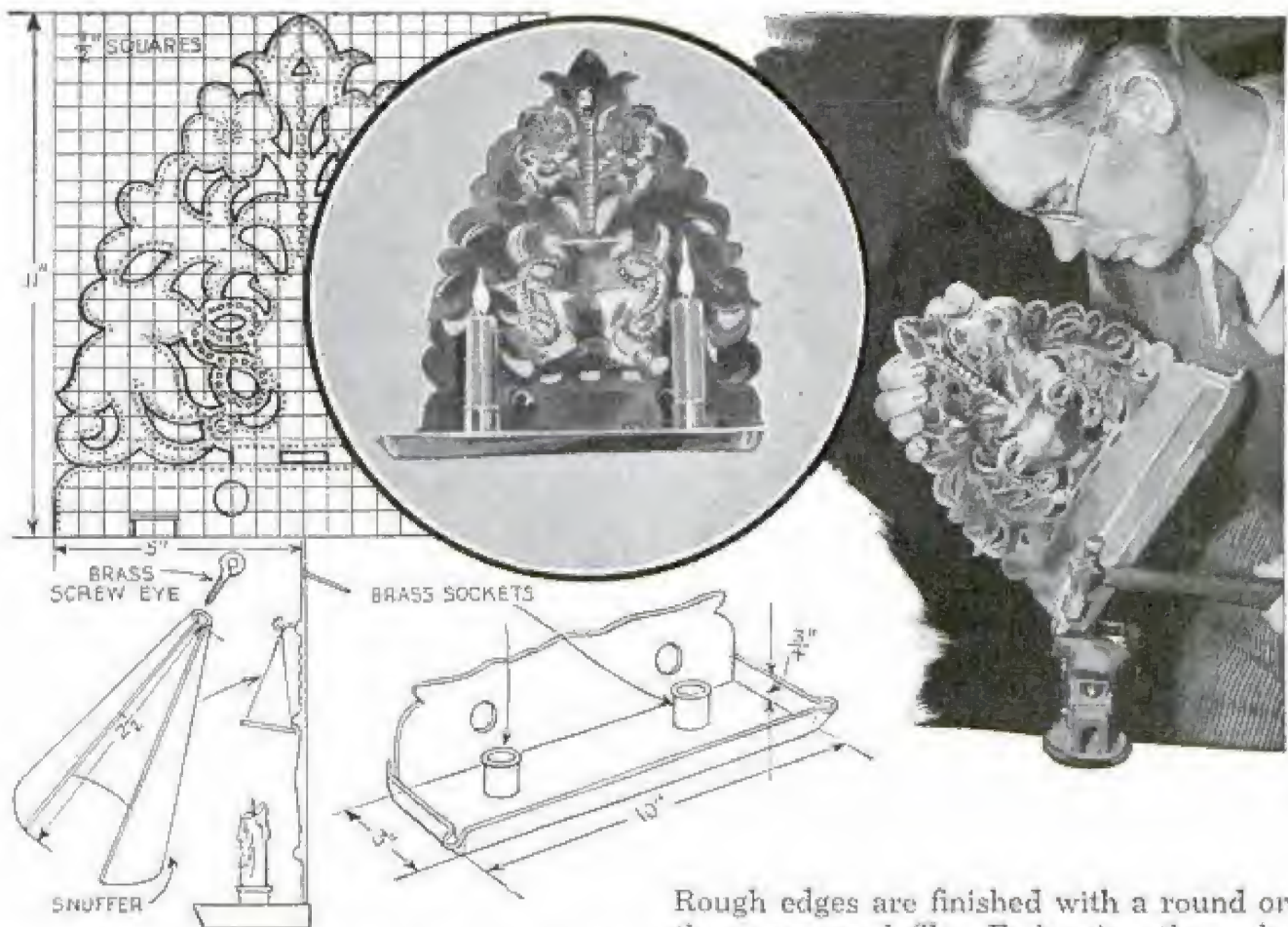
1 1/4 in. chromium tubing are plugged at each end with a turned plug to provide a tenon for gluing as shown in the lower insert of Fig. 15. Uprights of chromium-plated tubing are also fitted to the openings in the side members by cutting to a wedge fit and fastening by driving a small pin through the metal into the wood at a tangent. In place of chromium tubing, common 1 3/8-in. standard closet rod may be used and finished in contrast to the rest of the table.

Having a top of white imitation leather, the third type of table, shown in Figs. 17 and 18, consists of a 4-in. rectangular frame supported by four simple uprights of 3/4-in. stock. A leather-covered panel of 3/4-in. plywood is wedged in place up through the bottom of the mitered frame to project slightly above it. Several wood cleats

screwed to the inside of the frame and into the top, hold it firmly in place. Blocks 2 1/2 in. square are mortised to receive tenons cut on the lower ends of the uprights as in Fig. 16, and are connected with stretchers of polished metal tubing drilled for attaching with bright-headed screws. For rigidity of construction, 3/4-in. dowels serve as stretchers connecting the legs. Or, if you prefer, chromium-plated tubing can be used advantageously for this purpose.



# Antique Candle Sconce Tapped from Brass

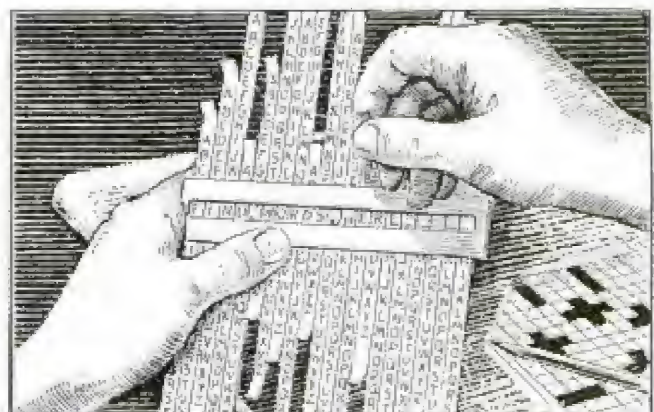


This handsome antique twin candle sconce can be duplicated by anyone with rudimentary experience in hammering brass. With the exception of the candle sockets and the snuffer, the entire job is made of a single sheet of brass. First lay out the design on  $\frac{1}{2}$ -in. squares and transfer to a smooth brass sheet with carbon paper. Cut the outlines with a cold chisel, laying the work flat on a sheet of lead or on the end grain of a hardwood block.

Rough edges are finished with a round or three-cornered file. Embossing the nubs or buttons is done with a round-nosed tool, the work being placed face down. For the larger embossed areas, such as the urn, a ball-peen hammer is used. When this phase of the work is completed, the pan or drip tray is bent to shape and sockets soldered in place. If desired, the tray can be made separately and riveted to the back. A simple snuffer is made from a sheet-brass cone with a brass screw eye soldered in the peak.—C. W. Case, Altadena, Calif.

## Crossword-Puzzle Fan Pulls Lettered Strips to Find Words

Here's a clever gadget that will help anyone in solving crossword puzzles as it is based on the fact that it is easier for most people to see combinations of letters than it is to imagine them. Twenty-six strips of tough paper, each lettered from A to Z, are slipped next to each other in a holder which has a slotted face through which any selected arrangement of letters can be seen. The width of the strips should be such that they can be slid back and forth individually in the holder.





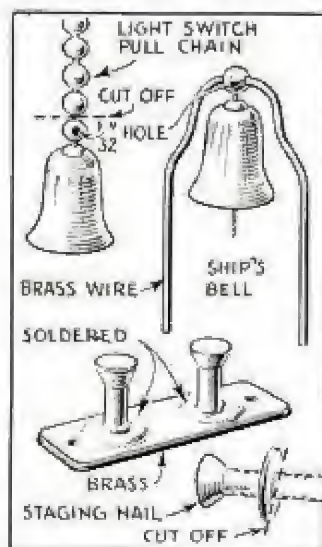
## Novel Photos With Spotlight and Ground Glass



Unusual effects produced on photos by setting object in front of ground glass illuminated by a spotlight

Novel and artistic effects can be had by placing the object to be photographed in front of a piece of ground glass supported vertically and illuminated from the rear by a focusing spotlight. This does away with the time and expense of having spotlight effects air-brushed on backgrounds. The light may be placed in any desired position and the size of the spot can be varied by simply moving the light toward or away from the glass.

## Bells and Bitts for Model Boat



A realistic ship's bell may be made from the bell-shaped attachment on the end of an electric-lamp pull chain. Cut off the bell and one brass bead from the chain, and drill the bead to take a 3-in. length of brass wire. Solder the bead in the center of the wire, and form the latter into a support as indicated. A short piece of twisted wire should be soldered inside the bell to represent the clapper and bell rope. You can also make ship's bitts

from staging nails of the type that have a flange about  $\frac{3}{8}$  in. below the head. The nails should be cut off just below the flanges and then soldered to a piece of brass about  $\frac{7}{16}$  in. wide and  $1\frac{1}{4}$  in. long. Flow the solder over and around the nail flanges so that the bitts have the appearance of a casting. Of course, bells and bitts of this type can be used only where their size is in proportion to that of the model.—Philip A. Eyrick, Arlington, Mass.

## Glycerine Loosens Bottle Stoppers

When a glass stopper sticks in a bottle, glycerine mixed with equal parts of water will usually loosen it. The mixture is best applied with a medicine dropper and it should remain on the stopper for a few minutes before trying to remove the latter. Be sure to wipe out the bottle neck afterward.



## Illuminated Photo Timer

Amateur photographers who do their own developing, contact printing, etc., will find that they can read their timers easily in a darkroom if small lamps are mounted on them to illuminate the faces. Just clamp a regular lamp socket to the timer top with a strip of tin, which is held in place with small machine screws or stove bolts. A couple drops of solder will keep the socket from turning in the clamp. Insert a 5-watt ruby lamp and put on a ten-cent shade.



—E. W. Sheldrick, Detroit, Mich.

Ⓒ Bone or pearl-handled knives should never be allowed to soak in dishwater; the handles should be dipped into hot, soapy water, and dried at once.



# Crafting with FOIL MOLDING



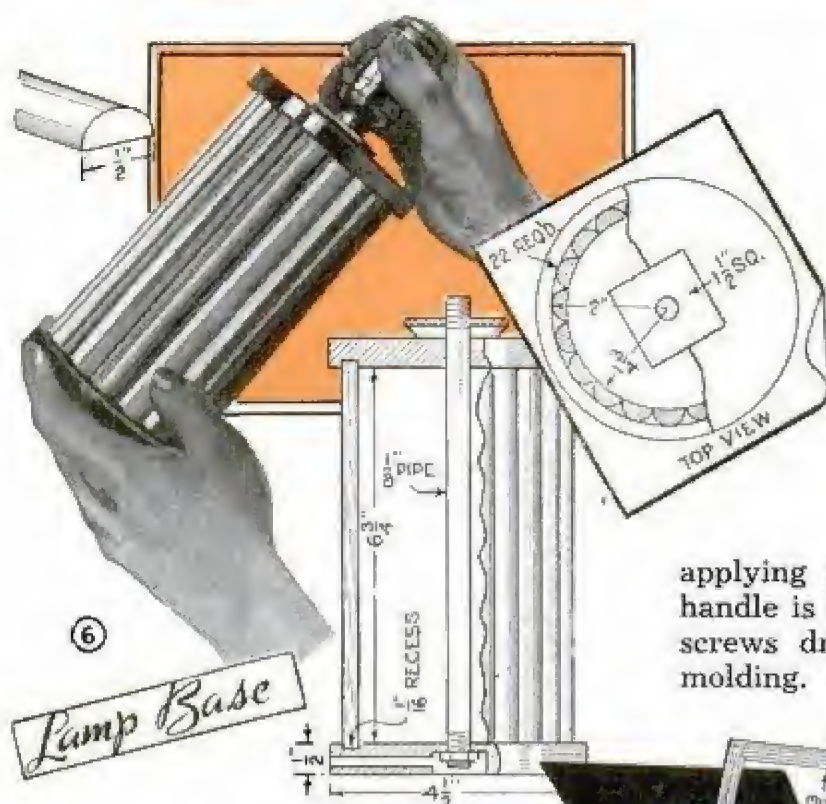
**R**ESEMBLING highly polished metal, wood molding covered with gold, silver and copper foil, Fig. 2, is a new workshop material offering many opportunities in constructing inexpensive but attractive articles in craftwork. A few suggestions pictured here are picture frames, lamps, wall shelves and serving trays.

The material is available in half-round shapes of  $\frac{1}{2}$ ,  $\frac{3}{4}$  and 1-in. widths in standard 8-ft. lengths. When sawing it, you can avoid tearing off the foil from the wood core by cutting the stock from the face rather than from the edge. This can be done on a power saw but if one is not available, a hack-saw blade used in a miter box, will produce a fine cut. The wider molding is especially suitable for picture framing as shown in Fig. 1, and a new, simplified method of doing this is pictured in Fig. 7. Cut a mat of tinted cardboard and paste the picture behind it. Then glue mitered strips to the face of the mat at the edge to form a border.

One of the most stunning uses of the  $\frac{1}{2}$ -in. molding is the smart lamp base shown in Figs. 3 and 6. It consists mainly of twenty-two equally cut lengths fitted into grooves cut in two disks of black plastic or wood. Assembly is made by using a length of pipe through the center of the disks, one end of which carries a pull-chain





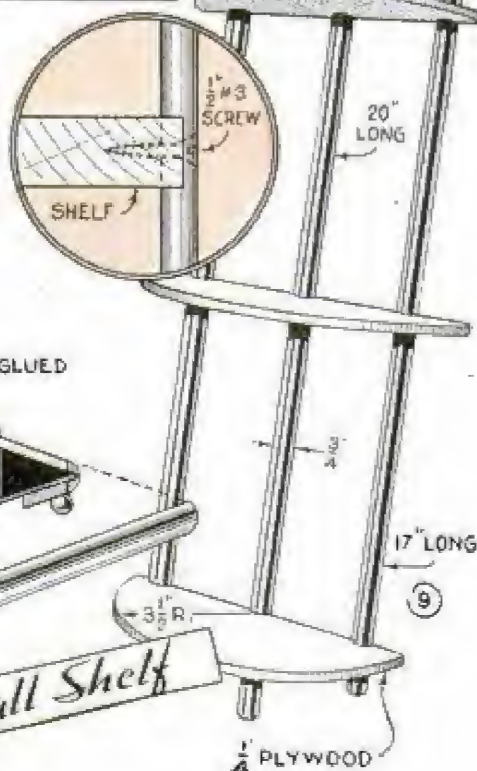
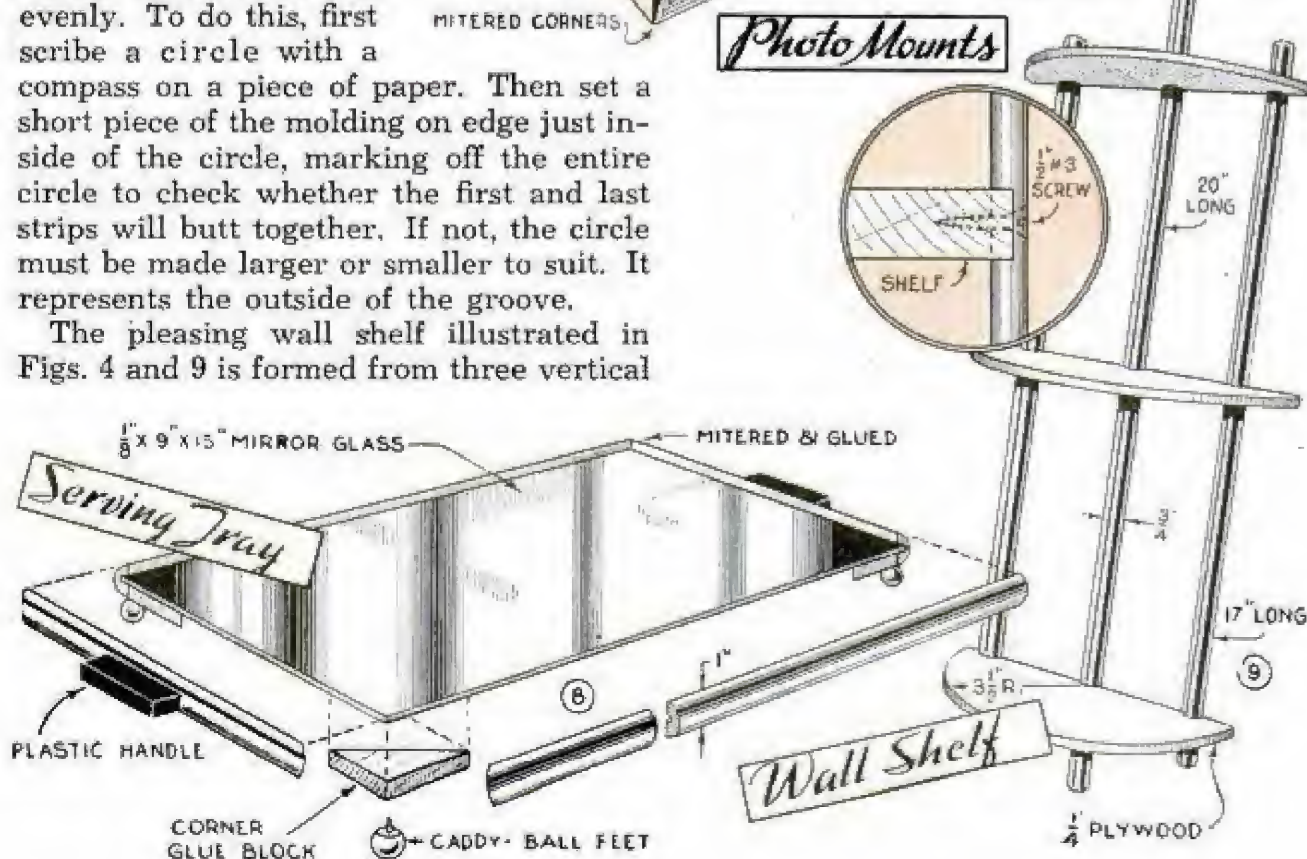


lamp socket while the other end is fitted with a nut to draw the assembly tight. Care is required in cutting the grooves accurately to make sure that the strips will come out evenly. To do this, first scribe a circle with a compass on a piece of paper. Then set a short piece of the molding on edge just inside of the circle, marking off the entire circle to check whether the first and last strips will butt together. If not, the circle must be made larger or smaller to suit. It represents the outside of the groove.

The pleasing wall shelf illustrated in Figs. 4 and 9 is formed from three vertical

strips of molding notched to accommodate three semi-circular shelves. These are painted black and are solidly attached with small screws inserted through the molding from the back. To make the tray shown in Figs. 5 and 8, first purchase a mirror of suitable size. Around this you make the frame of the molding, grooving the flat side lengthwise to take the glass, and then mitering the corners, being careful to get the grooves in alinement. Before

applying glue to the mitered corners, a handle is attached at each end with short screws driven in from the back of the molding. On the underside of the tray a





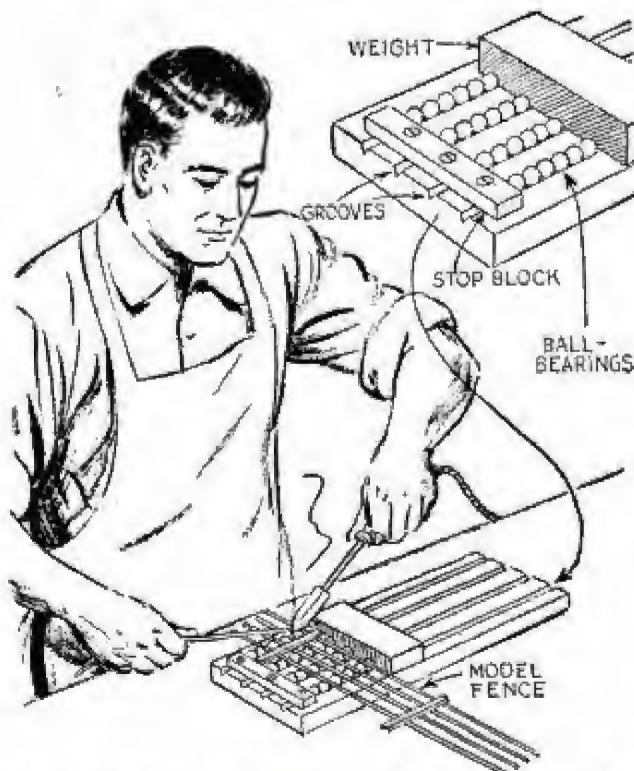
triangular shaped glue block is fitted at each corner into which chromium-plated caddy balls are screwed to serve as feet.

Among other uses of the molding is the trimming of modern furniture, such as the edging of table tops, and the forming of smart grillwork. Any ingenious craftsman will be able to devise numerous other practical applications.

### Bars of Model Fence Spaced by Balls for Soldering

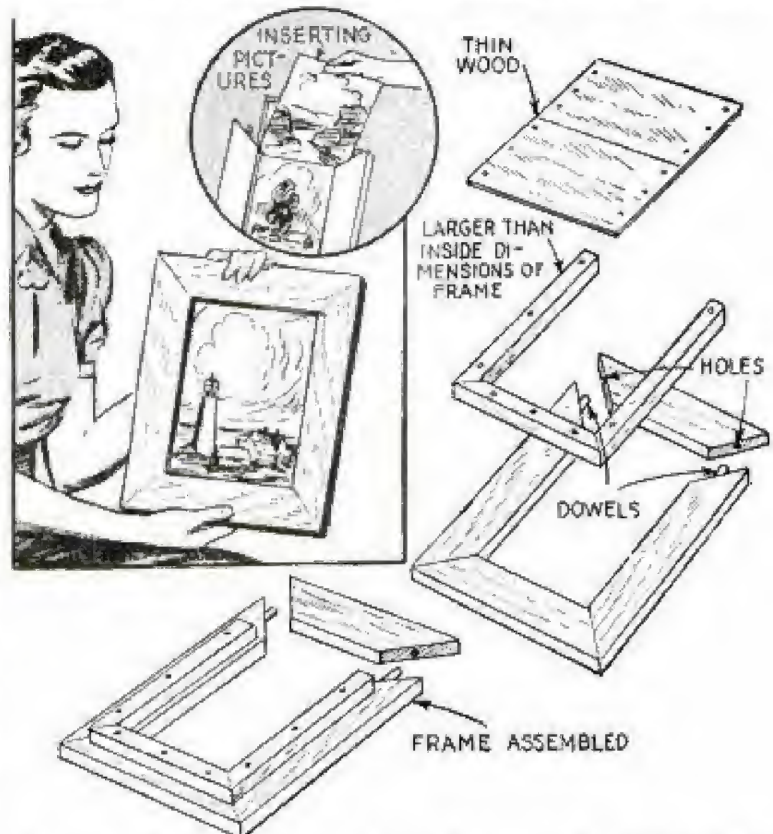
The job of spacing and holding wood or metal strips while gluing or soldering them to crosspieces to form a model fence or grillwork, may be done quickly by using some steel balls of the required size as spacers. A rectangular wood block has several shallow grooves cut in the surface about 1 in. apart to hold the balls. The balls are retained at one end of the block with a stop and at the other end by means of a movable weight. The fencing strips are placed across the balls, spacing them one or more balls apart.

—W. C. Wilhite, Carlinville, Ill.



Spacing of parts to assemble fences or grilles for models done accurately with steel balls

### Pictures Interchanged Quickly In Frame with Removable End



Any one of several pictures in this frame can be shifted to the front by lifting off the top member

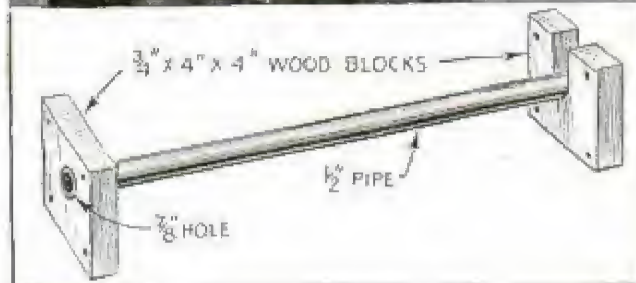
This frame holds a number of pictures, and allows any one of them to be exposed to view merely by lifting the top member of the frame and shifting the desired picture to the front position. The original frame was made to display pages of a photographic annual assembled with a spiral binder, which was removed and the loose sheets placed in a receptacle behind the frame. Conventionally bound books and magazines are prepared by cutting out all the sheets wanted with a razor blade and straightedge. One end of the frame is mitered in the regular way, while the loose end, which is the upper one, is held by dowels. These are glued into holes in the side members, and fit loosely in holes in the removable piece. Thin plywood, nailed to strips on the back of the frame, provides a pocket or receptacle with an open end for storing several pictures.

—John G. Roberts, Chicago.

Ⓒ In an emergency, important letters can be sealed by placing several drops of colored fingernail polish at the joint of the flaps so that the envelopes cannot be opened without tearing the seals.



## Pipe in Doorway Serves as Rest for Large Faceplate Work



*Pipe anchored in doorway supports tool when turning large work on outer end of lathe spindle*

Large faceplate work swung on the outer end of the lathe spindle can be worked with a pipe tool rest fitted across a doorway. A length of  $\frac{1}{2}$ -in. pipe long enough to span the doorway is used. This is held in place by means of two wood blocks, the blocks being screwed in place at the proper position to bring the top of the pipe to the center of the work. When not in use, the pipe can be removed, and the lathe returned to its usual position.

## Washers Provide Good Cord Ties



slipped on a wood screw. In use, the cord is wrapped once between the washers and

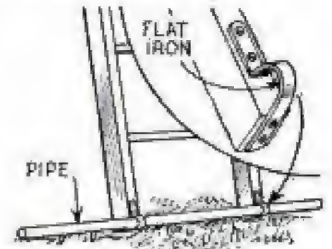
Quick-acting ties to hold awning and porch-shade cords are assembled easily from large faucet washers. The beveled faces of two washers are placed together and are

the loose end is pulled down past the taut portion of the cord as indicated in the photo. This tends to bind the end so that it will not slip.

—Frank Bentley, Clinton, Ia.

## Ladder Has Pipe on Lower End to Avoid Twisting

Electricians, painters, tree surgeons and others who work on a ladder will find this ladder base handy as it prevents the ladder



from twisting on uneven ground. To assemble the base, bend two strips of heavy flat iron to the shape indicated and screw them to the lower ends of the ladder, to take a length of pipe, which gives greater support than the ladder legs alone.

## Washing-Machine Mangle Stored on Shelf

After being asked several times to provide a place to store the washing-machine mangle when it was not in use, I hit on the idea of fastening a piece of pipe to a shelf



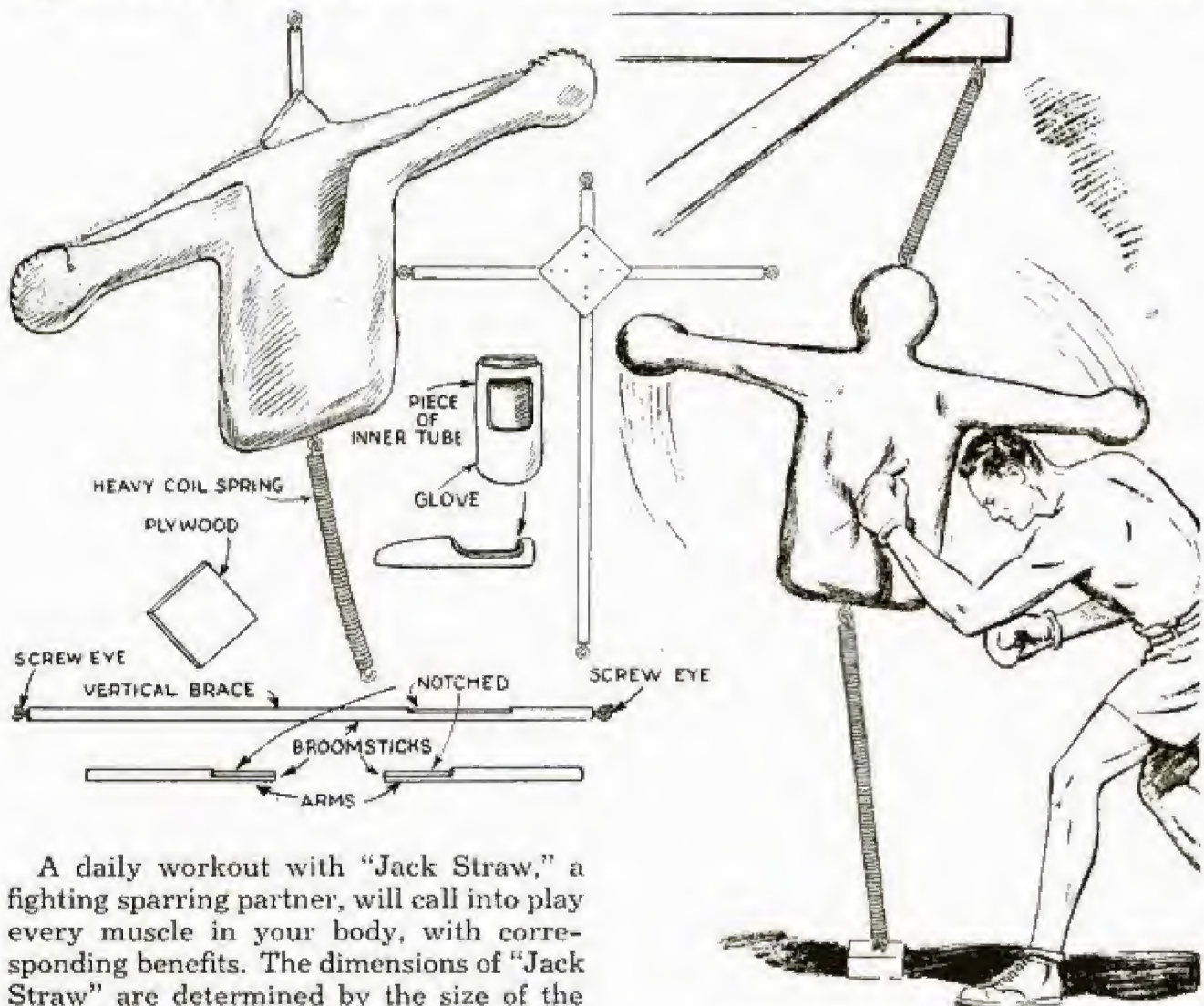
*This holder supports the mangle securely at the same height as the washing machine*

by means of a floor flange, as indicated. The advantages of this arrangement are that the mangle is kept at a height that is easy to lift it to; it swings out or into place and is easy to reach to put on the machine.

—R. Stanley Werner, Boise, Idaho.



# Sparring Partner Gives You Daily Exercise

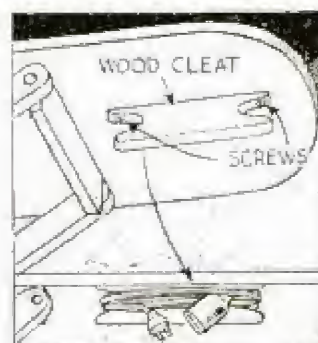


A daily workout with "Jack Straw," a fighting sparring partner, will call into play every muscle in your body, with corresponding benefits. The dimensions of "Jack Straw" are determined by the size of the builder, with the exception of the arms. To determine their length, bend your arm as though you were delivering a hook; measure from the center of your chest to the knuckles. The body of "Jack Straw" is cut and sewed from canvas. Use a lap and sew with a lock or back stitch, using a good grade of twine. After the body has been partly sewed, the framework is installed. Broomsticks are ideal, but the ends should be drilled before twisting in the screw eyes. The best packing for the body is lawn clippings, well dried in the sun and rammed in tightly. "Jack" may be suspended anywhere, for there is no noise or vibration that accompanies the usual bag punching. His reaction to your blows can be regulated by changing the tension of the springs. To get the greatest benefit from "Jack Straw," you should know something of boxing. All boxing is based on the "one-two" punch, which is leading with the left and following with the right,

using any combination you wish. For instance, you may start off with a straight left to "Jack's" head, swing on the hips and deliver a hard right into the body. Or a hard left to the body and an overhand right to his head. Use your legs and keep moving, and always remember to lead with your left hand!

—E. W. Ross, Hollister, Ohio.

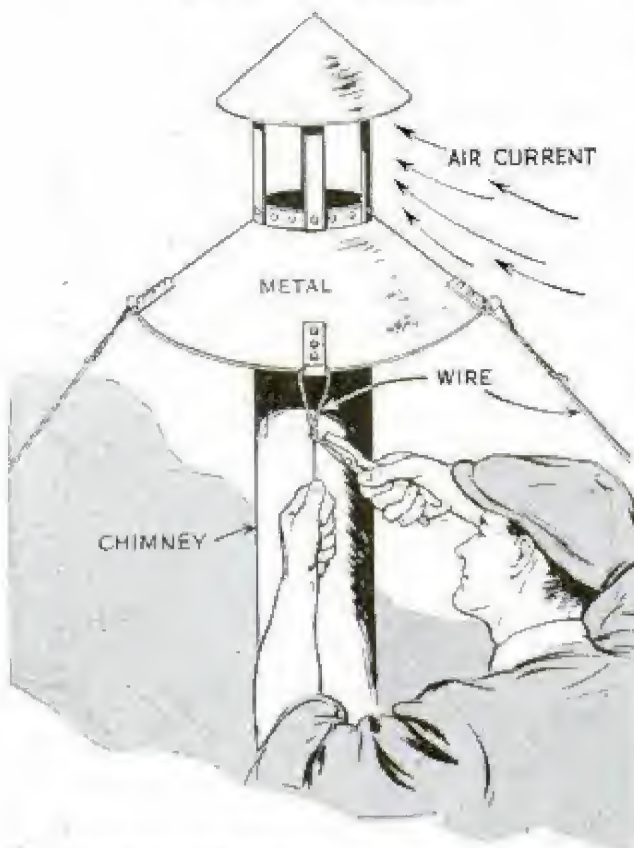
## Iron Cord Stored Under Board



To keep the electric-iron cord where it will be convenient, wind it on a wood cleat cut to the shape shown and attached with screws under one end of the ironing board.



## Draft Inside Chimney Increased by Cone Collar



Sheet-metal cone on chimney deflects air currents across top causing greater suction

A Wisconsin tinsmith, confronted with the problem of increasing the draft of a chimney without adding to its height, constructed a cone-shaped skirt or collar, which was attached just below the top of the pipe. This deflected the moving air current from any direction at an angle across the top of the chimney and aided materially in creating more suction.

## Making Ship-Model Moldings



A small block of wood and a piece of hack-saw blade are all you need to make a tool for shaping tiny moldings for your ship model. Groove the surface of the block to take the

saw blade so that the teeth project a distance equal to the depth you want to cut in the molding. Also, space the groove from the edge of the block a distance equal to the distance you want the groove to be

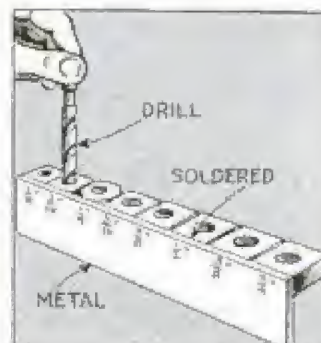
cut in the molding. You can make up several of the tools and space the saw groove differently in each one to cut various moldings. A thin strip nailed to the edge of the block serves as a guide or fence.

## Foreign Particle in Eye Located with Aid of Magnifying Glass

A foreign particle in the eye that is hard to locate often can be seen with the aid of a magnifying glass held in front of a mirror. Get as close to the mirror as possible. The hand that holds the glass can pull down the lower eyelid, thus leaving the other hand free to remove the particle.



## Drill for Tap Selected Quickly



Here's a gauge to determine the correct size drills for taps. Just solder a number of nuts of different sizes to a strip of flat metal, and scribe or paint the nut sizes on the latter. A drill that

fits snugly into a nut of the same size as the tap to be used is the one to select.

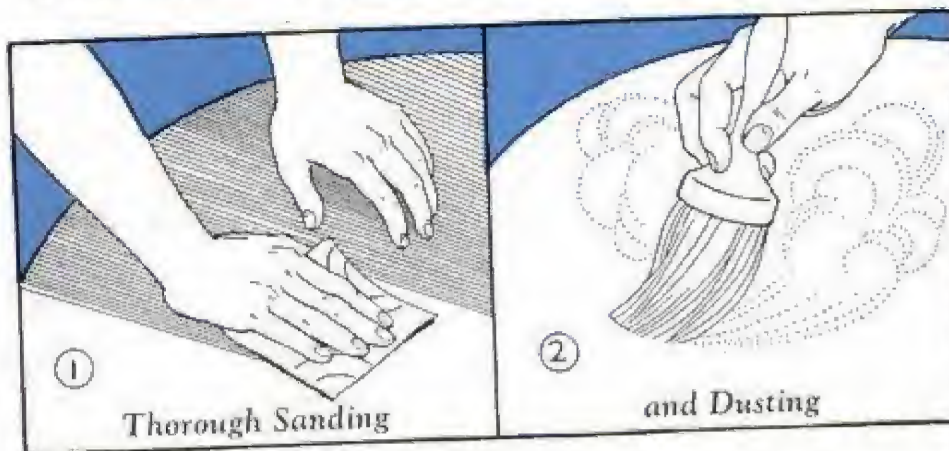
## Curved Ruler Measures Distances on World Globe

Keep this curved ruler near your world globe for measuring distances on the map. The ruler consists of a thin wood block with one edge curved to the contour of the globe, and marked off in inches. A small hole in the edge of the ruler takes a dowel which serves as a finger grip.





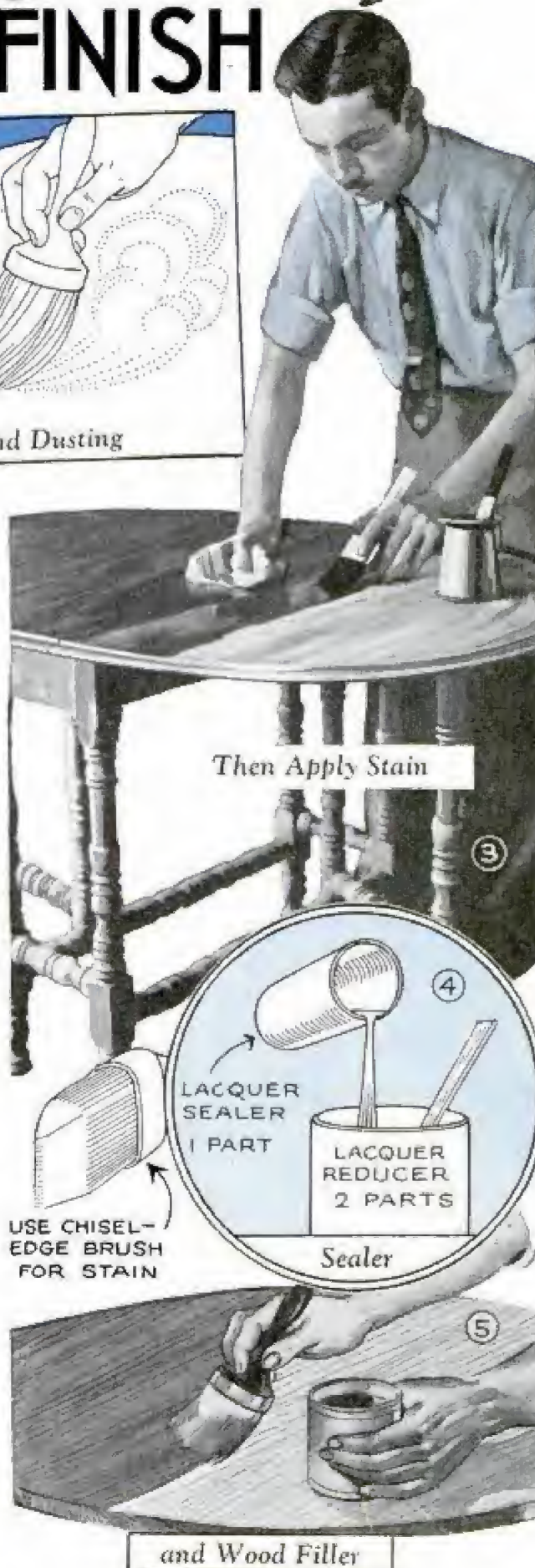
# There's Lasting Beauty in a WOOD FINISH



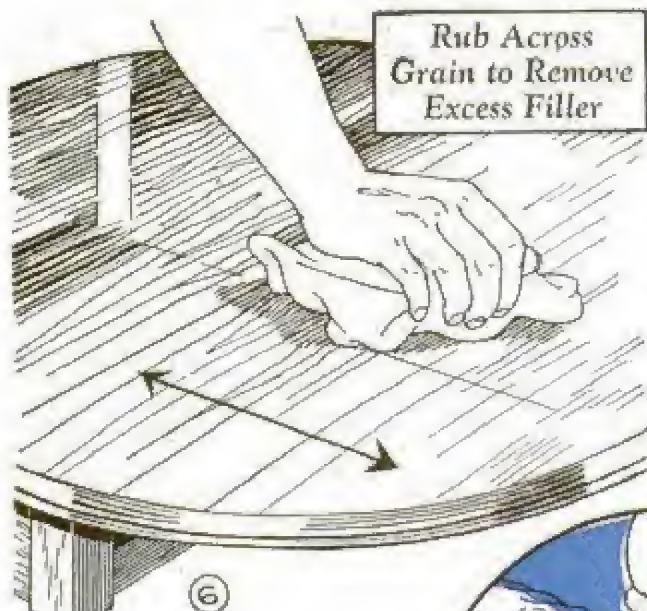
**H**OW does the expert produce the soft glow of finely finished wood? How does he give his work that unmistakable professional appearance? He will tell you that there are over twenty operations in a top-rate job of hand-rubbed finishing, and that most of these steps have to do with careful and intelligent attention to small details, simple things that one is apt to overlook. The other operations have to do with applying the right materials in the proper sequence.

**Sanding:** In starting with any article not previously finished, you first go over the piece thoroughly with fine steel wool, then No. 7-0 sandpaper, Fig. 1. A helpful trick is to use a large piece of old inner tubing or other flexible pad, wrapping the sandpaper around it to reach into crevices more easily. Clean up all tool marks. Dust off with a dusting brush as in Fig. 2, or with compressed air if available. Sand and re-sand. A thorough sanding job is the beginning of a good finish.

**Staining:** First apply a thin glue sizing, allow it to dry and sand lightly. Water-soluble aniline dyes which are best for staining mahogany, for example, have been transferred to anhydrous solvents. Water stains of this type are non-grain-raising, have a clear color and tone and do not clog the pores because they are completely dissolved. The water stain will accentuate the beauty of the grain more than most oil stains. Walnut and mahogany will respond beautifully to this treatment but when you







use other woods and endeavor to give them a walnut or mahogany finish, you are obliged to consider the wood, rather than the color of the finish. If, for instance, you are using one of the Philippine woods which are often mis-called Philippine "mahogany," you are not dealing with mahogany at all. It is said to require extra work and care in the finishing. Some finishers say that it requires excessive sanding to lay the grain properly, absorbs excessive amounts of finishing materials, and remains lifeless. To imitate mahogany, select birch. Using the proper stains and procedure sequence certain pieces of this wood will finish in a remarkably close simulation. Likewise, selected cherry can be finished to match walnut.

Spray the stain very lightly on a thoroughly wet surface—unless the directions with the stain preparation advise differently. Or, use a sponge or large brush to apply thinly, but delicately. Then allow to dry, scrutinize the result, and re-apply, if necessary. Wood, such as mahogany, darkens with age. It may be a light salmon pink when freshly cut, and change to a sherry with time. Your job, therefore, is to achieve this sherry tone immediately. Naturally dark stains are positively out. The object is to bring out grain by intensifying it with successive light applications of stain, Fig. 3.



*Philippine Mahogany*  
296 Phillips

**First Sealer Coat:** Allow the stain to dry for four hours or more. The sealer coat, Fig. 4, consists of alcohol, 4 parts, to four-pound-cut white shellac, 1 part, or, use lacquer sealer, 1 part, to lacquer reducer, 2 parts. The sealer coat brings out the highlights and makes it more transparent. If possible, spray it on as in Fig. 8.

**Filler:** Allow sealer coat to dry at least four hours. Sand thoroughly, dust thoroughly. A secret is to use filler, regardless of the character of the wood. Experts do. The filler for the job should be of inert material and it should be a shade darker than the stain, Fig. 5. Add pigment as desired—for brown mahogany, use Van Dyke brown or burnt umber;



Sealer and Lacquers are Best Applied with an Air Brush

for red mahogany, use burnt sienna and Van Dyke brown; reduce with naphtha and brush on with the grain. In 4 to 8 min., wipe across the grain with circular motion, using burlap. On turned parts proceed as in Fig. 7. Wipe until completely clean. Dry overnight, preferably in a warm room. Do not rush—the old wood masters never did.

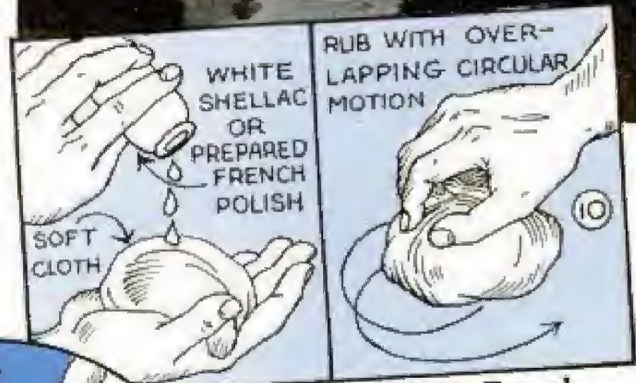
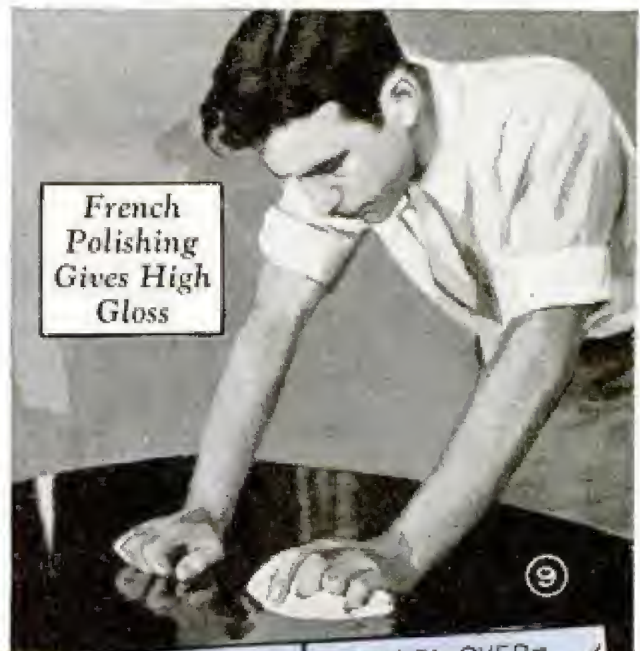
**Second Sealer Coat:** Spray on as in Fig. 8 if possible. Make this coat slightly heavier—a little less reducer. Dry at least one hour. Sand with No. 7-0 sandpaper and don't forget to remove dust.

**Glazing:** To achieve an antique finish,

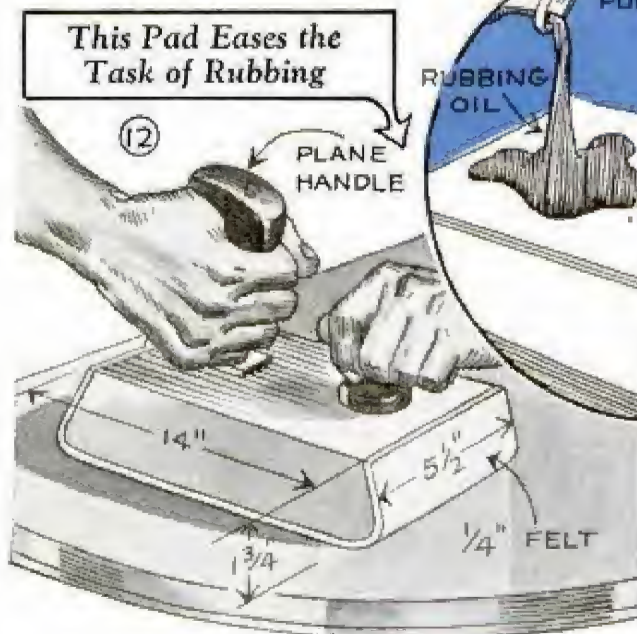


with certain parts highlighted at the corners of flat surface, around grooves, legs, and knobs—apply glazing stain, rubbing it off except in the parts just mentioned. Allow to dry overnight. Or, for an antique look on the piece, use a special antique stain in the staining process. The dealer in decorators' or wood finishers' supplies will tell you which.

**Finish Coats:** Clear lacquers are generally preferred by professional finishers. Good lacquers are quick-drying, resist water, heat, alcohol, scratches and are easily washed with soap and water and polished. The new synthetic varnishes which have a Bakelite base, are excellent, too. Also, shellac with a polishing-off wax will give you good service. But most satisfactory as a rule, is good lacquer. Three coats, with 48 hrs. between each coat, and sanding between each—is the usual procedure. Use an air brush for lacquer, if possible. Apply a gloss lacquer for the first two coats, then a flat type for the third to give extra body. Lacquer all over—front, back, inside. For a less dull effect, use a soft cloth or felt dipped in rubbing oil, Fig. 11, then in American



Preparing Pad for French Polishing



ground Italian pumice stone and rub gently. For a still duller effect, use pulverized pumice and water. Wash off and dry with chamois. Polish with paste wax. When the wax has been absorbed, wax some more, rub some more, wax and rub and so on and on as long as possible. The pad shown in Fig. 12 will help out on this job. The

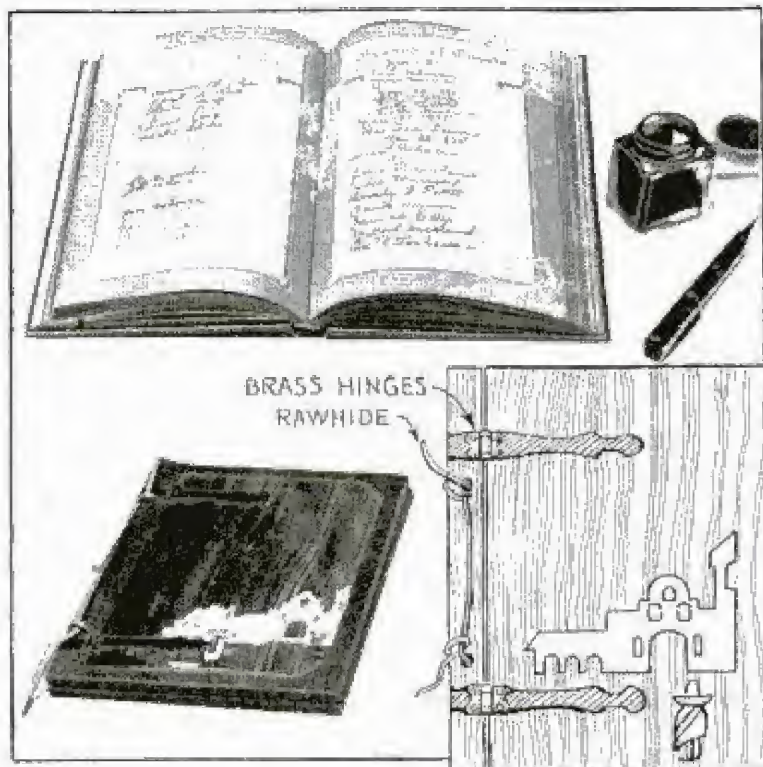
beauty grows in direct proportion to the amount of rubbing you do.

**French Polishing:** This is an interesting antique finish in which there is a maximum of hand rubbing. Sandpaper, stain, etc., omit lacquering and instead apply raw linseed oil. Let it dry 24 hours. Sandpaper again using No. 7-0 paper. Dust. Dissolve French polish or shellac gum with alcohol to a very thin liquid. Apply with pad, using circular motion, Figs. 9 and 10, adding just a drop of raw linseed oil, now and then. When the surface of the article has been gone over in small sections, this way, about four times, set it aside and allow to dry 48 hours. Repeat the process at intervals of 48 hours as long as you like, except that the final rub-down ought to take place six days after the preceding, just to give the second to the last coat time to season. The beauty grows with each polishing.

*Craftsmen*



## Guest-Book Cover of Thin Wood Is Attractive



*A variety of appropriate designs can be painted on the cover to enhance its appearance*

An interesting and serviceable cover for a guest book can be made from  $\frac{1}{4}$ -in. wood, the cover being bound with rawhide and hinged with brass as indicated. Select a wood with an attractive grain. Various designs can be painted on the wood to further enhance the appearance of the cover. It can be applied to other books, such as journals, household-budget books and scrap books.

## Removing Grease Spots

Old grease spots on paper or cloth may be removed by rubbing them with a mixture consisting of calcined magnesia rubbed to a paste with benzene. The benzene dissolves the grease and the magnesia absorbs it. The paste is applied to the spot and rubbed with the fingers. For old grease spots it may be necessary to apply the preparation several times. The mixture can be preserved in a wide-mouth bottle if kept well stoppered. This cleaner is particularly effective for use on clothing as it does not leave a ring. A good cleaning compound which is effective in removing grease spots from clothing is made by dissolving glycerin, 1 oz., strong ammonia,

2 oz., and ether, 1 oz., in the order given in distilled water, 1 pt. After thoroughly shaking this mixture, add it to a solution made by dissolving castile soap, 1 oz., in distilled water, 1 pt. The completed solution should be shaken vigorously before using. The material to be cleaned is stretched out on a clean, flat surface and rubbed with a sponge soaked in the cleaner. When the spot has been softened completely by the cleaning compound, it may be washed away with clean water.

## Drain Table in Sink for Vegetables

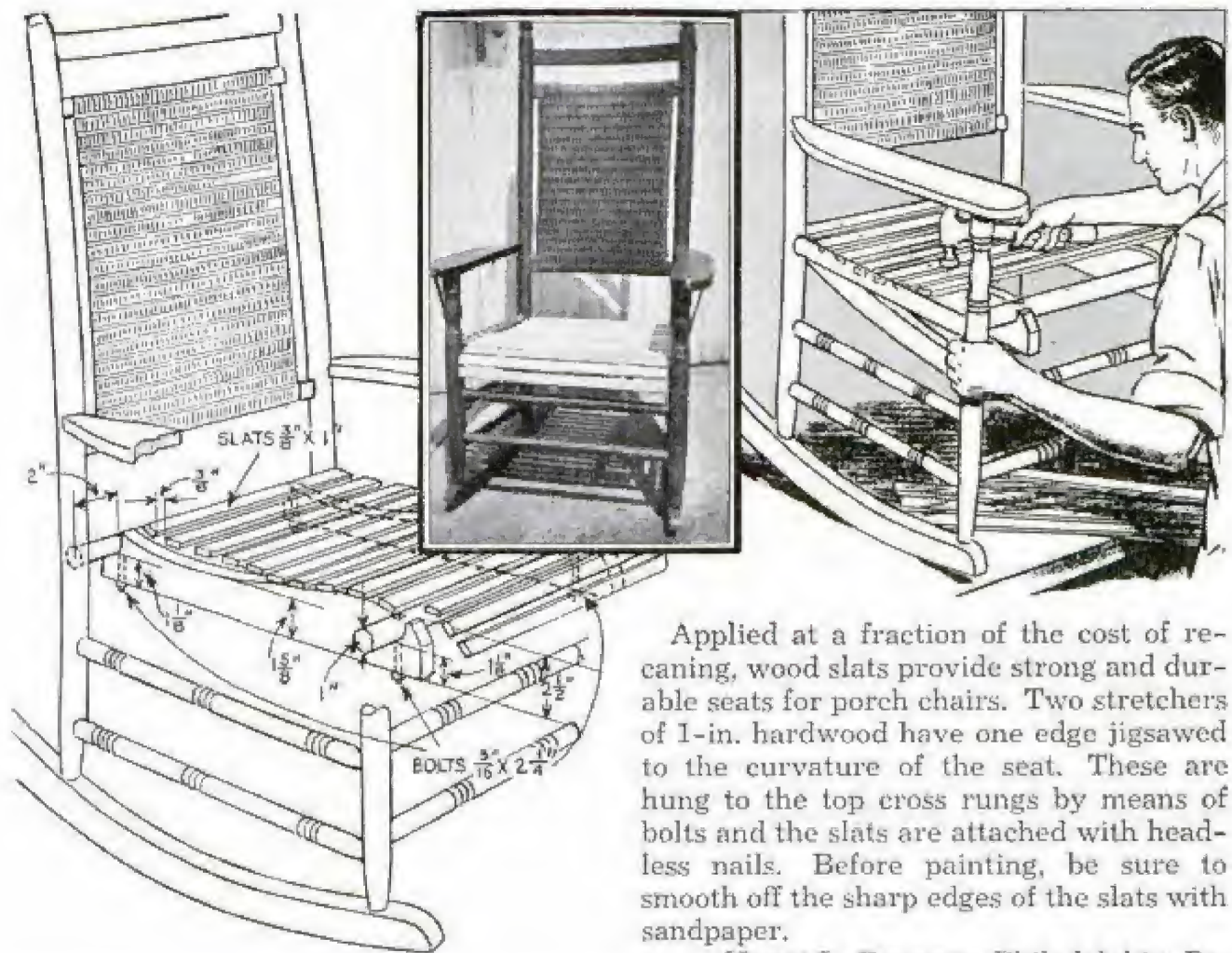
In preparing vegetables for the table, many women like to clean them under running water at the sink. This can be done quite easily by using the little table in your sink, as shown. It consists of a wood top with four short legs, the top having several holes in it to permit the water to drain off. The table can be made any size, depending upon the sink in which it is to be used.—O. Read, Chicago.



*Set this table in your sink and you can prepare vegetables quickly while water flows over them*



# Slats Replace Cane Seats on Porch Chairs

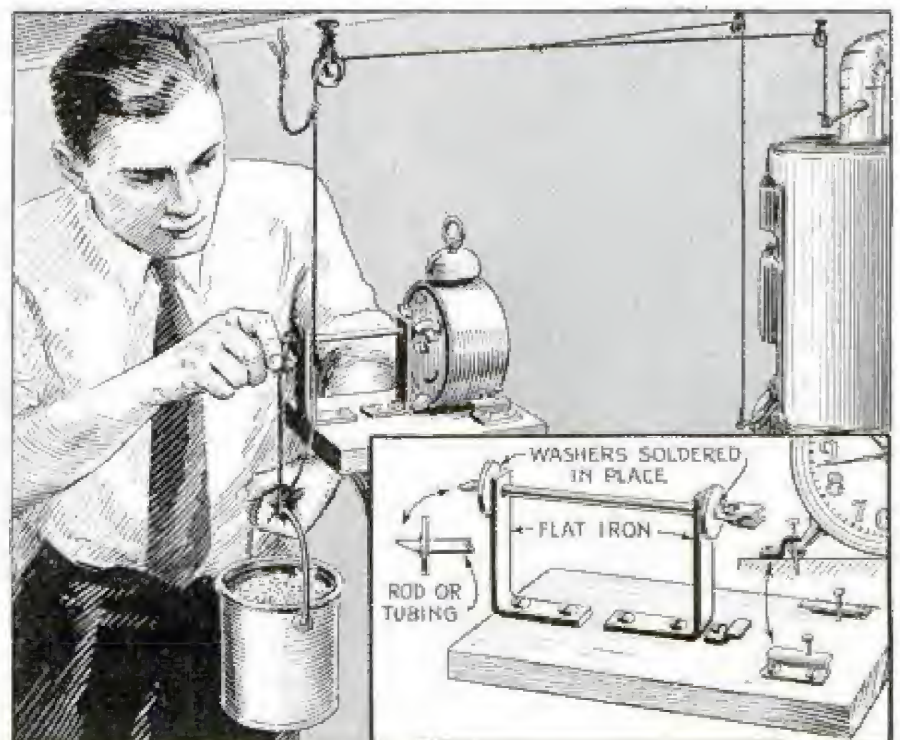


Applied at a fraction of the cost of re-caning, wood slats provide strong and durable seats for porch chairs. Two stretchers of 1-in. hardwood have one edge jigsawed to the curvature of the seat. These are hung to the top cross rungs by means of bolts and the slats are attached with headless nails. Before painting, be sure to smooth off the sharp edges of the slats with sandpaper.

—Harry L. Brunner, Philadelphia, Pa.

## Trip on Alarm Clock Drops Weight to Open Furnace Draft

Besides opening a furnace draft door at a pre-determined time so you won't have to arise an hour earlier than the household, this simple tripping gadget on an alarm clock has numerous other applications in controlling mechanical devices. An extension shank, fitted to the alarm key of the clock, has a steep bevel at the free end which releases a loop of cord or wire carrying a weight. When the alarm clock is set, the bevel should point upward, and the loop should hang just over the end.

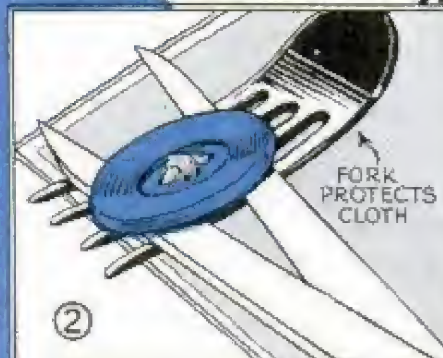




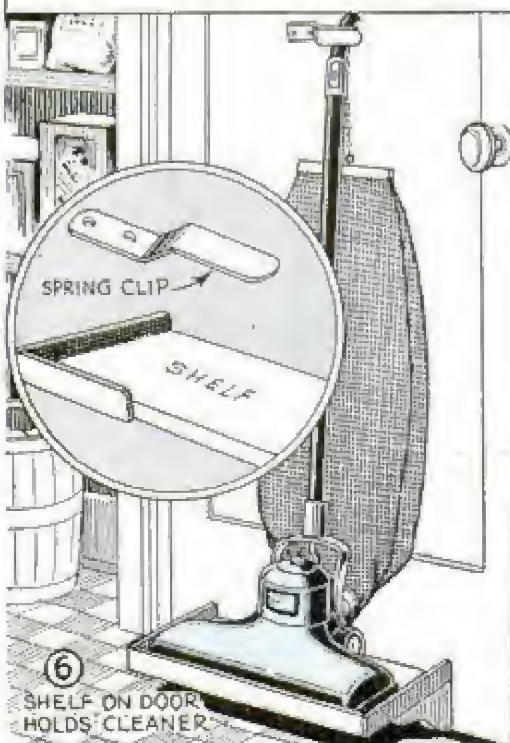
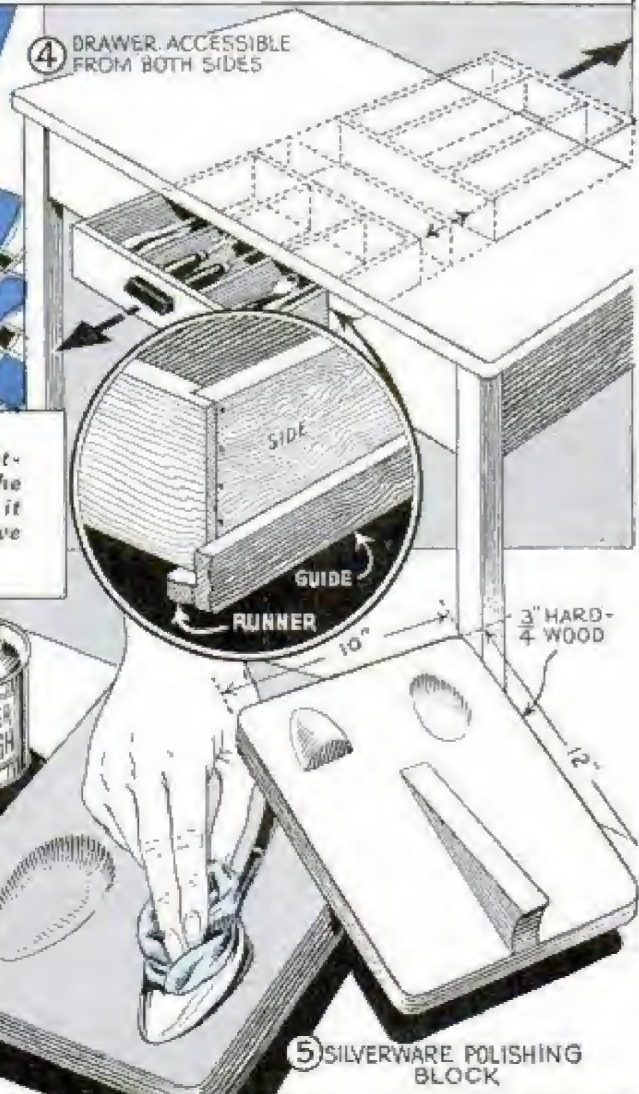
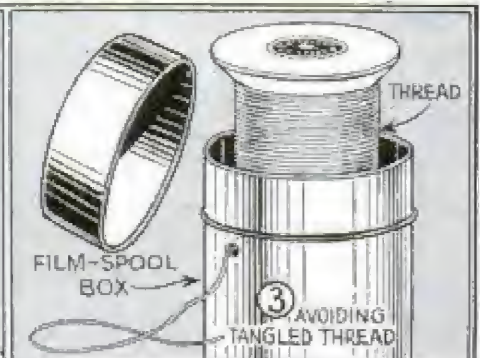
# Solving HOME



When laying new linoleum, the curled edges will flatten out if you apply hot water with a mop as in 1. The drawer in your kitchen table can be altered so that it is accessible from either side as in 4, which will save steps, especially if it is away from the wall



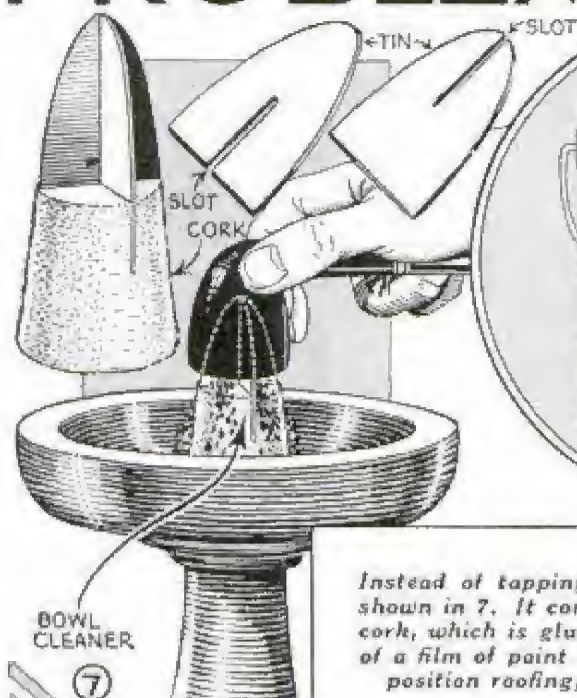
Before cutting a button off a garment, slip a table fork under it as in 2, so the scissors won't damage the cloth. Thread can't tangle if the spool is kept in an empty 35 mm. film box or similar container as in 3



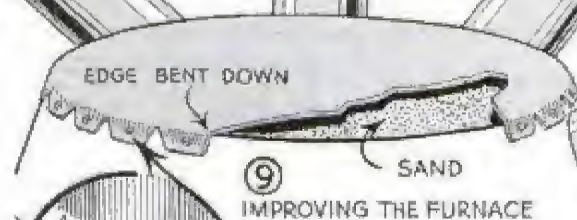
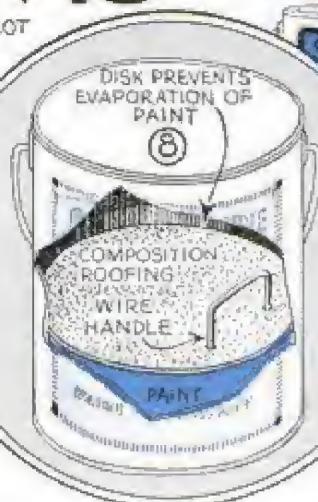
Half the work of polishing silverware, which is in holding the pieces, is simplified with the block shown in 5. The toe from a cheap wood shoe tree holds a spoon while polishing the back, and a depression gouged out of the surface of the block provides a seat while polishing the inside. Knives can be placed on a triangular piece. A shelf on a pantry or closet door, 6, is a good place to store your vacuum cleaner



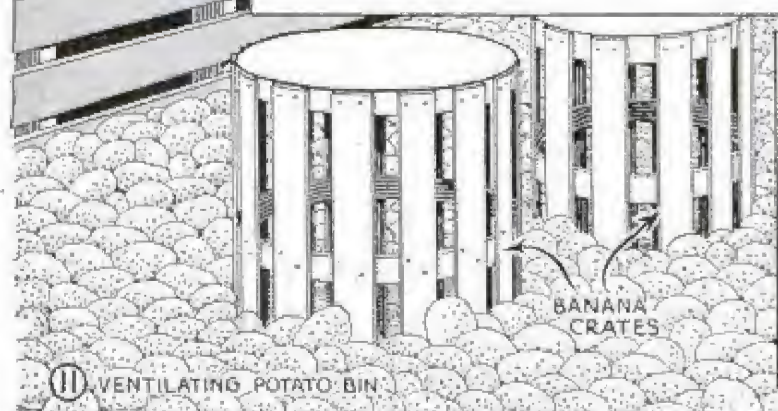
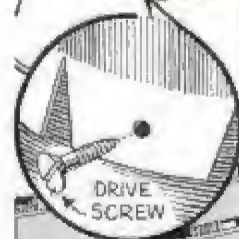
# PROBLEMS



Instead of tapping your pipe to clean it, use the cleaner shown in 7. It consists of two pieces of tin inserted into a cork, which is glued to an ash tray. To prevent formation of a film of paint in a partly filled can, use a disk of composition roofing, cork or other flexible material as in 8.

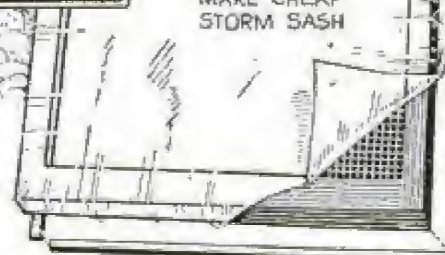


Sheet-iron cover over sand on furnace bonnet, 9, keeps dust from collecting. 10, house slippers in a cloth bag closed by elastic band in the hem, are always at hand under your favorite chair.



12 CELLOPHANE-COVERED SCREENS MAKE CHEAP STORM SASH

When storing your potatoes for the winter, first set banana crates in the bin as in 11, to ventilate the potatoes at the bottom. One crate for each 36 sq. ft. of bin surface is sufficient. To provide cheap storm sash, cover window screens with Cellophane as in 12. Fold it over the screen edges and fasten it on the inside surfaces with molding, so that the latter, unpainted, is not visible from the outside.





## Fuel Tank Mounted on a Trailer Services Tractor in Field



*Fuel for tractors and other farm engines towed from place to place in this trailer tank*

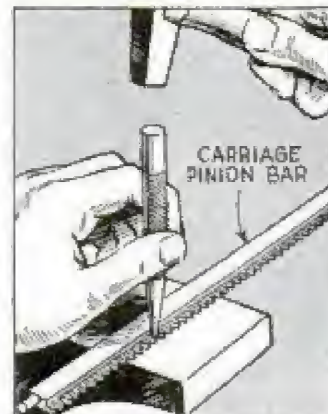
Patterned after oil-truck transports, this farm fuel trailer speeds up servicing engines and tractors in the field, especially during harvest. The tank is mounted on improvised, channel-iron running gears with wheels from an old wagon. The ex-

tended platforms on each side, with railing of pipe and chains, permit carrying a number of cans and hand tanks.

—Dale R. Van Horn, Lincoln, Neb.

## Repairing Typewriter Carriage

When the carriage of a typewriter skips at a certain spot, the trouble may be caused by a worn tooth in the pinion bar beneath the carriage. If the tooth is not worn too badly, it can be repaired in most cases by swelling



it slightly with a nail punch. The bar is, of course, first removed from the machine and, after locating the worn tooth, is placed on an iron surface and struck lightly with a hammer.

# What Kind of Boat Do You Want?

*Whether it's a simple rowboat, an outboard runabout or a family cruiser, you'll find something you want among our blueprints. Build your boat now for the coming season:*



21-Ft. Sloop "Arrowhead"—944 to 951

**"ARROWHEAD" SLOOP**—944 to 951: 21-ft. sailboat that can be built by average craftsman. Accommodates up to 10 passengers. Set of 8 prints \$1.50.

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**12-FT. ROWBOAT**—707: Flat bottom. Can be used with small outboard motor. 25c.

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Any six of these blueprints (not sets of prints) will be sent postpaid upon receipt of \$1.00

**Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago**

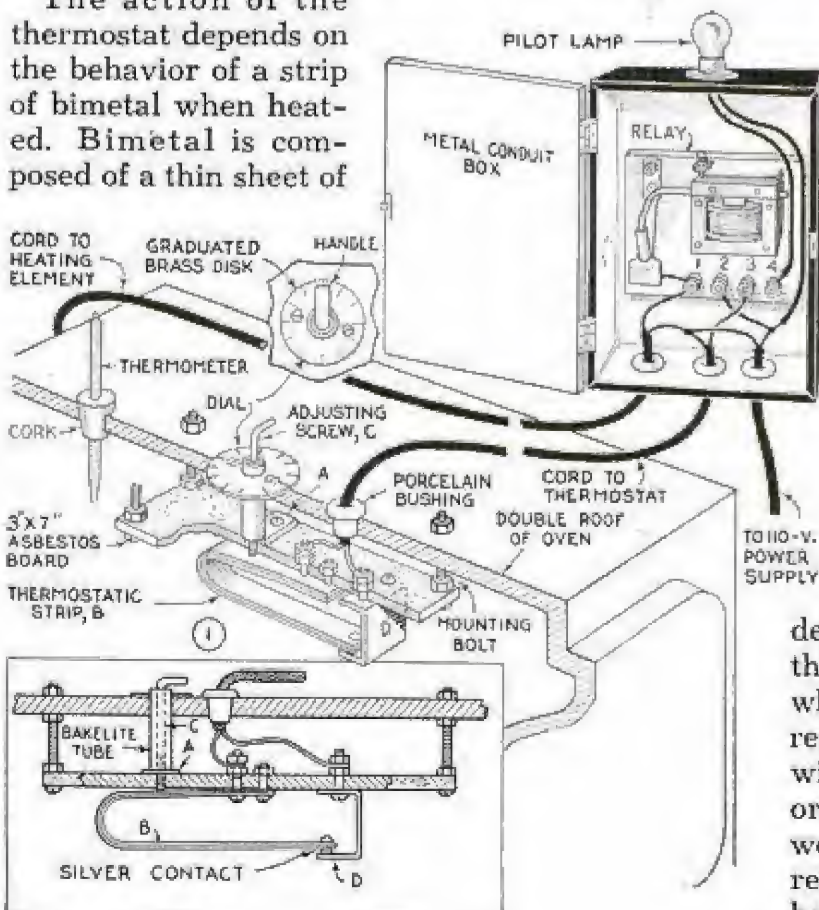
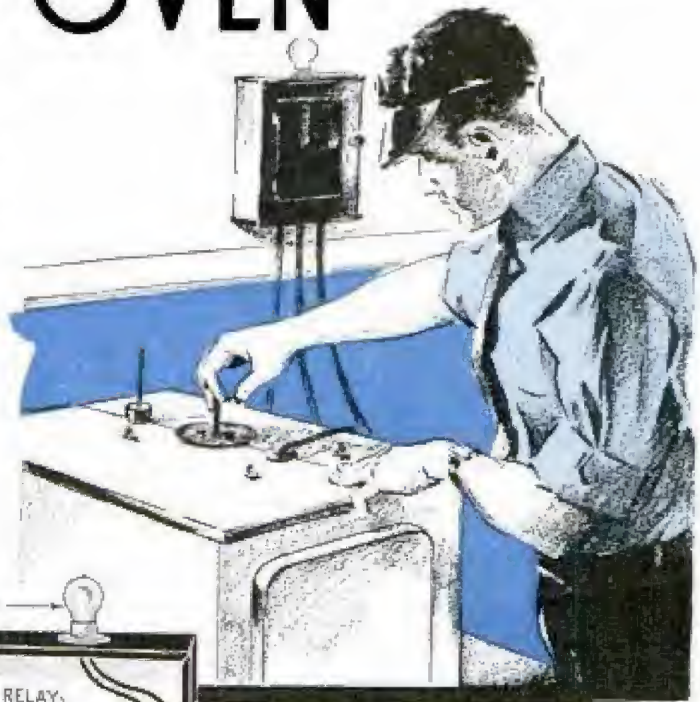




# Thermostat Controls Temperature in ELECTRIC OVEN

**E**LECTRIC ovens used in many shop heat-treating operations, such as baking enamels on metals, drying out compound-impregnated armatures, etc., can be kept at uniform predetermined temperatures by installing this control unit. It consists of a thermostat and a relay, which can be constructed at slight expense in any shop and will give reliable service, enabling the production of uniform work which is often impossible when the temperature of the ovens is regulated by hand.

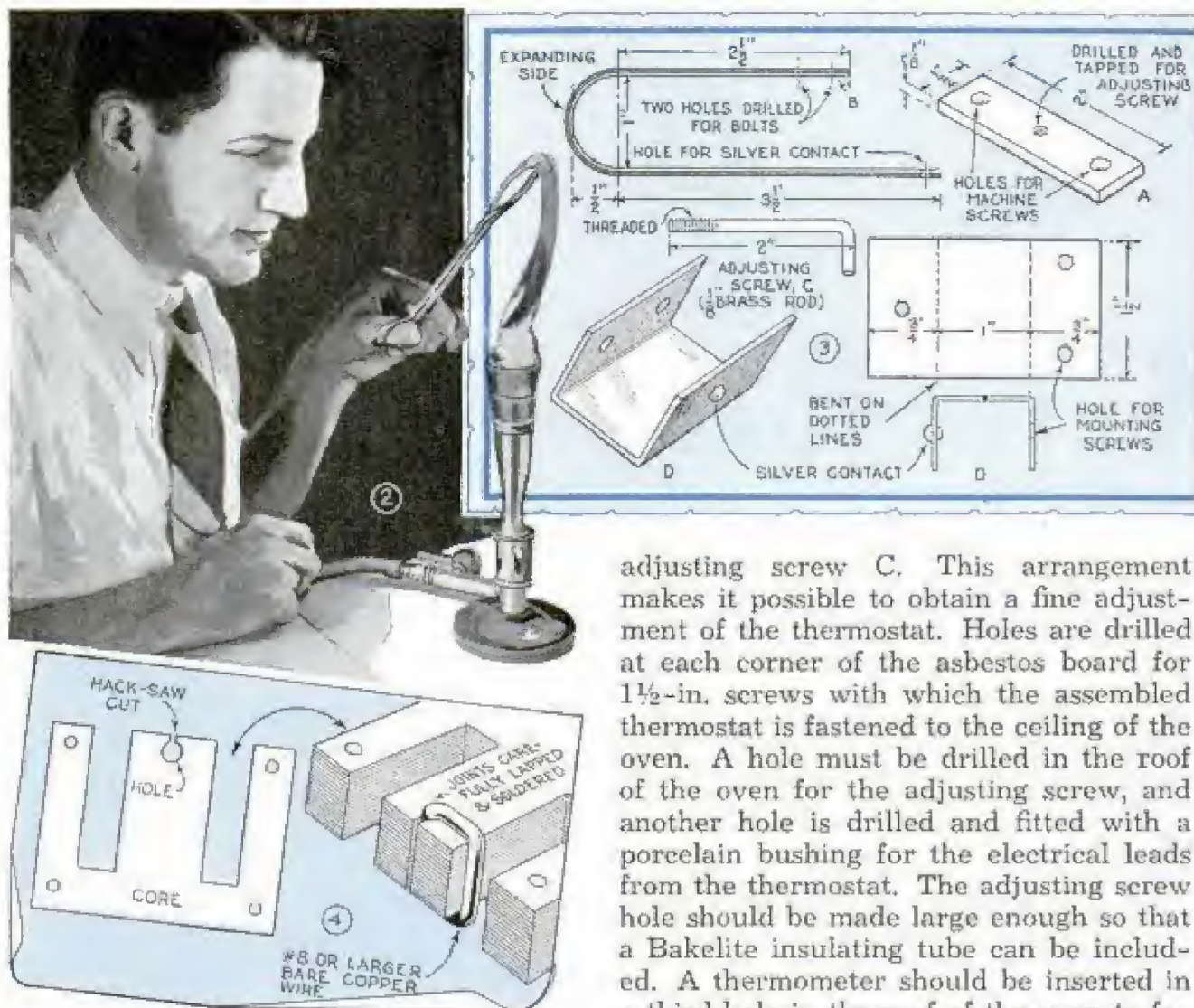
The action of the thermostat depends on the behavior of a strip of bimetal when heated. Bimetal is composed of a thin sheet of



an alloy and steel welded together. When a strip of this metal, known as "D-metal," is heated, the two metals expand; but since the alloy expands at a much greater rate than the steel, the strip bends or warps, with the alloy on the outside of the curve. In this thermostat, the strip of bimetal is bent into the shape of the letter U, as shown in

detail B of Fig. 1. A thermostat of this type is more sensitive than one which has a straight strip, and will regulate the temperature of an oven within 5 or 10 degrees, which is the ordinary variation for general shop work. The thermostat operates a relay which, in turn, will turn the heating current off when the de-





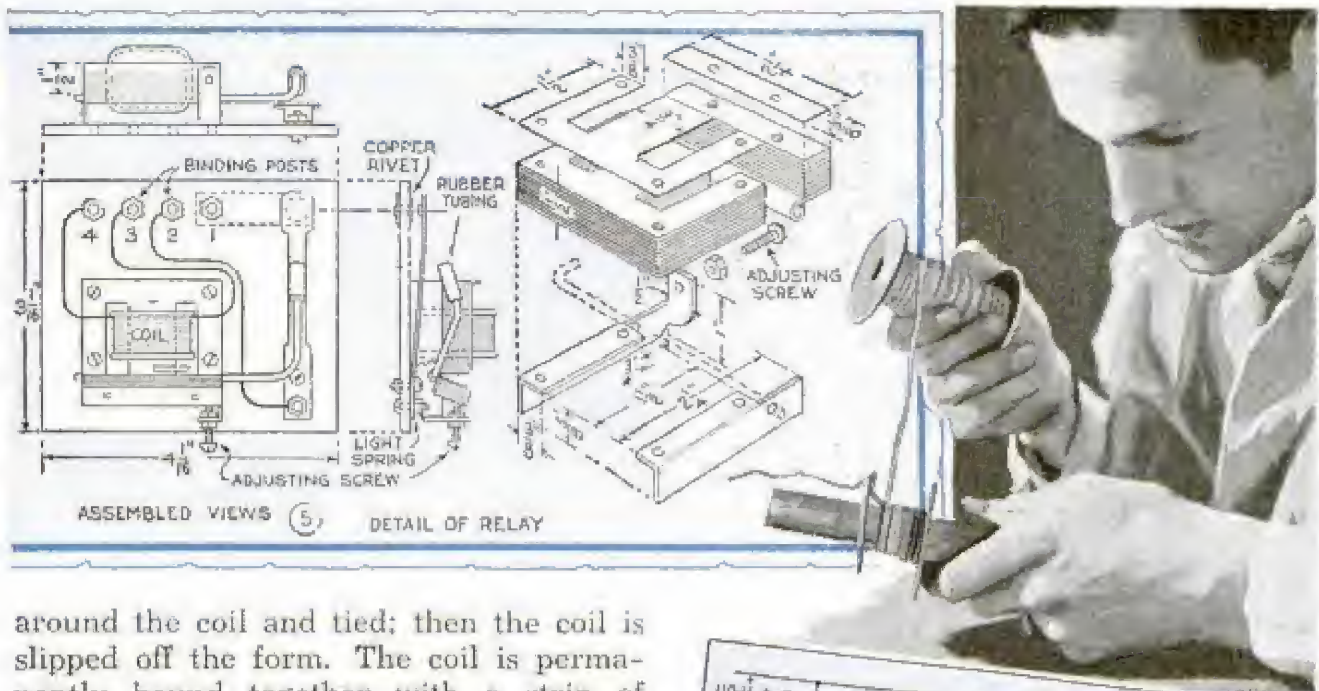
sired temperature is reached, and will turn the current on when the temperature falls lower than desired.

A strip of D-metal (bimetal .030 in. thick),  $7\frac{1}{2}$  in. long by  $\frac{1}{2}$  in. wide, is cut and bent as shown in Fig. 3. The expanding side must be on the outside of the curve, which is important as the proper action of the thermostat depends upon which way the strip bends when heated. To make sure which is the expanding side, hold the strip over a flame as in Fig. 2 until it bends or warps. The expanding side will be on the outside of this bend. A small hole is drilled  $\frac{1}{4}$  in. from the end of the long arm, and into it is inserted a short length of silver wire which fits snugly. This is riveted down on both sides and filed flat and smooth on the outside face to make contact with a similar contact on metal arm D, Figs. 1 and 3, which is mounted on a piece of asbestos board. Plate A, which is attached to the upper surface of the asbestos board, has a tapped hole for

adjusting screw C. This arrangement makes it possible to obtain a fine adjustment of the thermostat. Holes are drilled at each corner of the asbestos board for  $1\frac{1}{2}$ -in. screws with which the assembled thermostat is fastened to the ceiling of the oven. A hole must be drilled in the roof of the oven for the adjusting screw, and another hole is drilled and fitted with a porcelain bushing for the electrical leads from the thermostat. The adjusting screw hole should be made large enough so that a Bakelite insulating tube can be included. A thermometer should be inserted in a third hole in the roof of the oven to facilitate adjusting the thermostat.

As it is impractical to pass the heavy heating current through the thermostat, a relay is necessary. An old transformer core of the approximate dimensions shown in the right-hand detail of Fig. 5 is excellent for the magnet core of the relay. The coil is wound on a wooden form as shown in the photo above Fig. 6, the form being slightly larger than the leg of the core on which the coil will be fitted. One end of the form should be tapered slightly so that the coil will slip off easily. Cloth strips are laid lengthwise along the form and two layers of brown paper are wrapped about the part to be wound. The wire may now be wound about the form in close, even turns. For 60-cycle, 110-volt, a.c., 250 turns of No. 20 magnet wire will be required. For 25-cycle, 110-volt, a.c., 600 turns of No. 24 wire will be used, and for 110-volt, d.c., 500 turns of No. 22 wire are needed. When the winding is completed, the ends of the cloth strips are brought

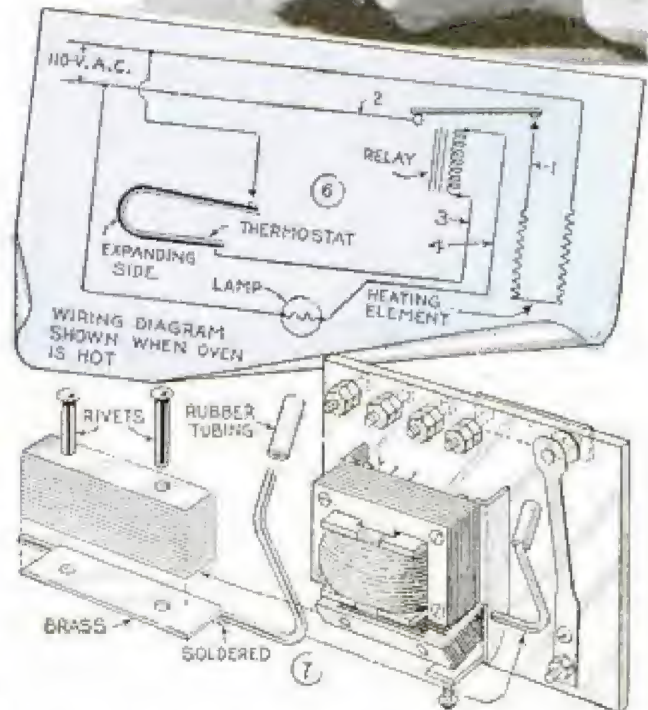




around the coil and tied; then the coil is slipped off the form. The coil is permanently bound together with a strip of friction tape on each side. It should be impregnated with shellac or varnish, dried, and baked in an oven. After this the coil may be slipped on the core.

The armature and the other moving parts of the relay are clearly shown in Figs. 5 and 7. The spring on the upper contact should be of very light spring brass. The armature should be mounted to fall back of its own weight, as shown in Fig. 7, when the relay is not actuated. If a slightly stronger spring is used, the position may be reversed as in Fig. 1. Here the relay is inverted with the armature on top, because in this case the weight of the armature is not quite sufficient to overcome the spring tension. This arrangement is advisable when the relay must be extremely sensitive in action. On an a.c. relay, it is necessary to add a shading coil to prevent hum, as shown in Fig. 4. The joint in the wire must be lapped and well soldered, or the effectiveness of the shading coil will be lost.

Fig. 6 shows the wiring circuit for the thermostat and relay. The completed unit is shown in Fig. 1. Both oven and relay should be mounted on a firm foundation, as free from vibration as possible. The relay may be mounted in a metal conduit box, as suggested in Fig. 1. The pilot lamp shown is essential to the proper operation of the circuit, its size in any particular set-up depending on the exact specifications of the relay and thermostat, vibration conditions, the strength of the spring in the



relay, and other factors. Therefore no specific directions as to lamp size can be given. First try a 75-watt lamp. If the relay does not operate properly, or if it "chatters," try a 100-watt lamp. If, on the other hand, the relay pulls up with only slight hum on a.c., reduce the size of the lamp gradually until a size is found that is just suitable to give positive operation.

Adjustment of the thermostat is made by means of the adjusting screw which comes through the oven roof. It may be necessary to alter slightly the curvature of the bimetal strip when the oven is first put into operation. A dial, made of thin brass, may be fastened to the top of the oven and calibrated for various temperatures.



## Cleats on Platform Save Labor for Truckmen



*Hand-truck operators will welcome the installation of these cleats on the loading platform*

Tipping heavy cases over to permit slipping the metal lip of a hand truck under them, can be eliminated on a busy loading platform by providing strips of wood to form a sort of track. These are spaced far enough apart so that the truck can be wheeled between them. The boxes are set on the track and the workmen find it easy to slip the truck in place to lift them without the additional task of tipping them over slightly.

## Hinged Door on Drain Pipe

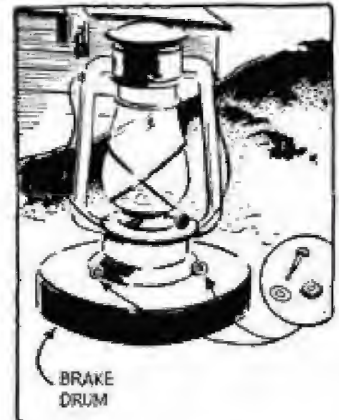


For best results, underground tile drains should terminate in a length of iron pipe for durability, and the exposed end of the pipe should be provided with a hinged cover, which is kept closed by gravity. This prevents rodents from entering and clogging the drainage system. The cover can be a disk

of sheet metal with a special hinge like the one shown in the photograph, or it can be held in position by a large strap hinge riveted to the pipe and cover.

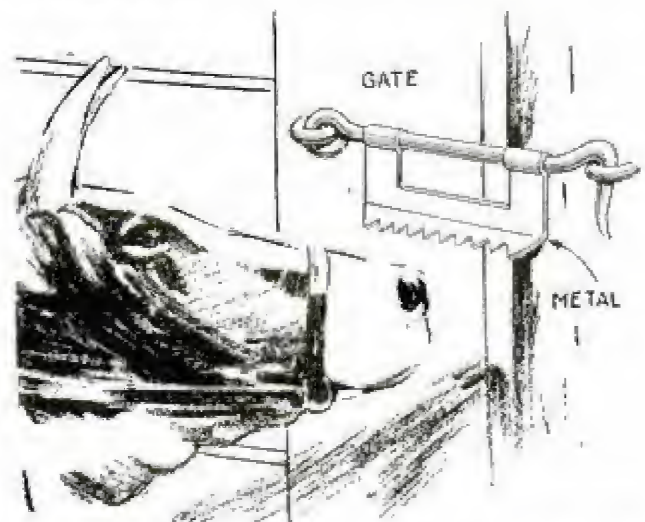
## Brake Drum Attached to Lantern Provides Safe Base

To avoid tipping safety lanterns left at danger points of a construction job, one contractor employs detachable bases made from discarded auto brake drums. These are drilled at three points to receive small stove bolts, which are provided with large washers. The bolts are placed so that the washers overlap the lantern base, and can be tightened to hold it securely in place. It is an easy matter to loosen the bolts and remove the drums.



## "Nosing" of Gate Latch Stopped by Guard on Hook

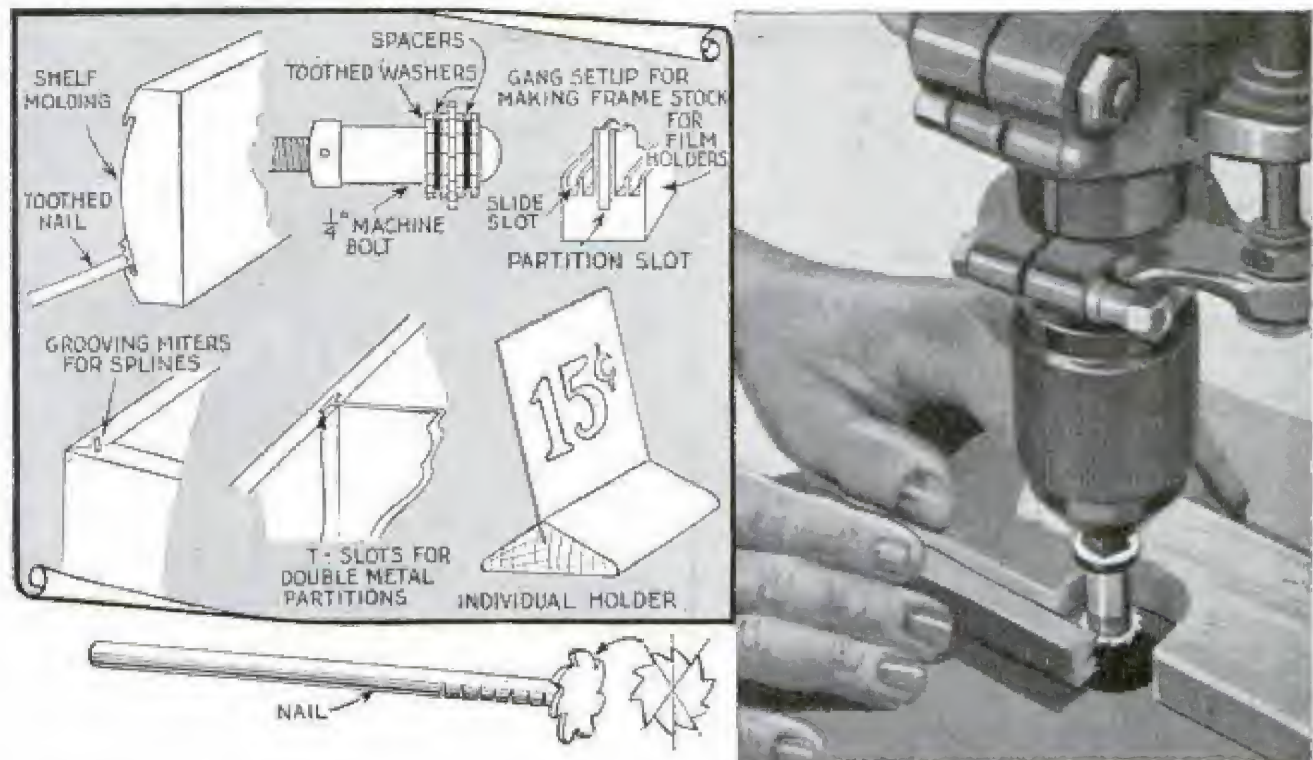
Horses or cattle that acquire the habit of "nosing" a gate latch to open it, may be cured quite effectively if this metal guard is attached to the latch. The bottom edge of the metal piece is serrated and bent out at right angles. A handhole in the upper portion of the metal permits any person to lift the latch.



*Animals can be broken of the habit of opening a gate latch by using this guard*



# Speedy Slotting Tools from Nails and Washers



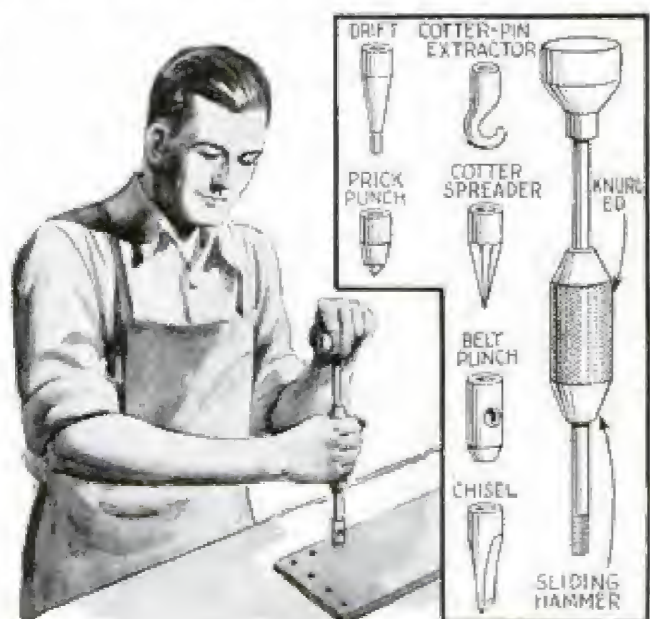
If you've ever encountered the problem of cutting tiny slots or grooves such as those shown above, you will appreciate the possibilities of this simple kink. By filing teeth in the head of a 10d. nail as shown, and cutting the body to proper length to fit the drill-press chuck with as little overhang as possible, you can do accurate T-slotting, undercutting, and grooving

even in medium hardwoods. Multiple slotting can be done easily with washers, teeth being filed in the edges in the same fashion as described for the nail head. A machine bolt makes a good arbor, spacing collars being used to bring the cutters in the desired position. Only a few minutes are required to make one of these special tools, yet they are quite durable.

## Machinist's Sliding-Hammer Tool Has Many Attachments

Simple to make and extremely handy because it combines so many tools in one unit, and requires little space in the tool chest, this tool is operated effectively by means of a sliding hammer of suitable weight. It is used for either tapping or pulling, and the hammer is knurled to enable the user to maintain a secure grip. The cone-shaped ends avoid injury from pinching. Among the attachments found handy are a prick punch, drift pin, cold chisel, cotter-pin extractor, cotter-pin spreader and a belt punch. However, many more applications can be devised.

☐ When cellulose cement is too thin, allow the tube to remain open for several hours, then close it overnight and the cement will have thickened uniformly.



Charles H. Willey  
1 Hill Crest Ave.  
P.O. Box 34



## Fowls in Crate Caught Safely with Rubber-Tipped Fork



*Holding a chicken in a crate while you reach in with the hands is easy if this fork is used*

Difficulty of catching a certain fowl in a crate among many others, led one produce dealer to improvise this fork. Two lengths of heavy wire are twisted together with the wires spread at one end to take a stout rubber band stretched across them. In use, the fork is inserted through the opening in the top of the crate, over the fowl to be captured, and is pushed down with one hand to hold the bird until the operator can reach into the enclosure with the other hand and remove it.

## "No Hunting" Sign from Disks



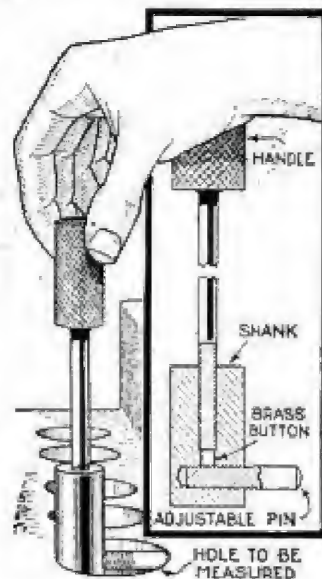
Because hunters kept firing shotgun pellets and rifle bullets through "no hunting" signs painted on wood, one farmer substituted blades from a disk harrow for the wood. The blades were cleaned and each

given a double coat of white paint. Then the lettering was painted on each one and a lag screw or bolt was used to fasten it to a post or tree.

## Gauge to Check Hole Diameters

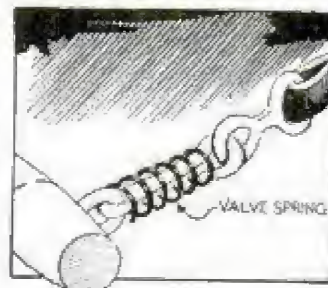
Finding the diameter of a hole with this tool is merely a matter of inserting it, running out the adjustable pin to a snug fit and then transferring the reading to a scale with a pair of calipers. The tool is made from three pieces of drill rod as indicated, the handle and adjustable pin both screwing into the shank. It's a good idea to use a brass button between the end of the handle and the pin to avoid damaging the threads on the latter when the handle is turned down against it. If a number of adjustable pins of different lengths are provided, the tool can be used to check a hole of almost any size accurately.

—Harry Sladen, Philadelphia, Pa.



## Spring Holds Harness Traces

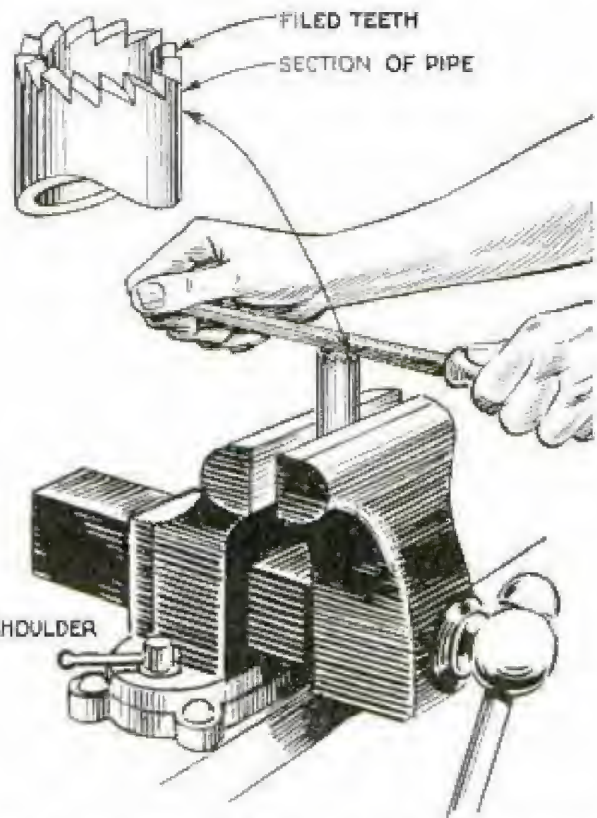
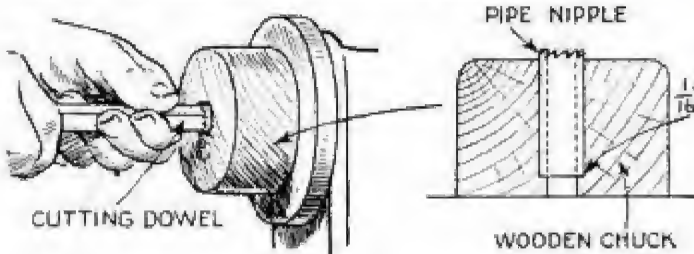
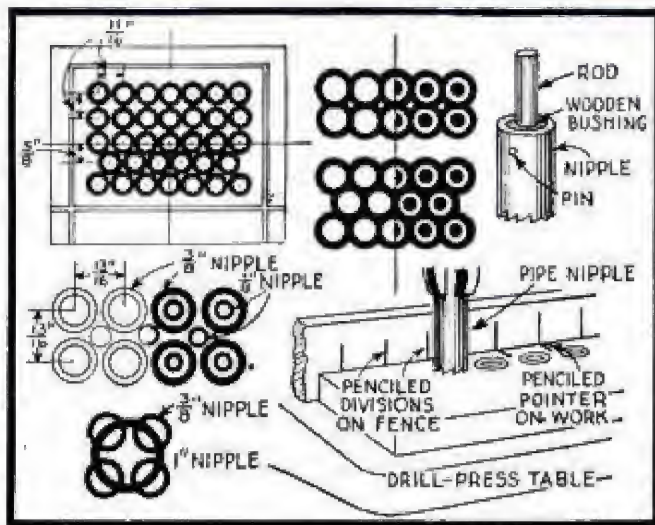
When a team is hitched to a drag or other tongueless implement, the horses may turn or back in the harness so that the traces become disengaged from the hooks of the doubletrees. This trouble is overcome by one farmer who slips discarded auto-valve springs over the hooks of the doubletrees. To fasten the traces, pull or compress the spring and slip the trace eye into place.



¶To attract attention to a sale of electric fans, a dealer places one on display with a large price tag tied to the wire guard so that it flutters when the fan is running.



# Pipe Routs Inlay Designs and Cuts Dowels



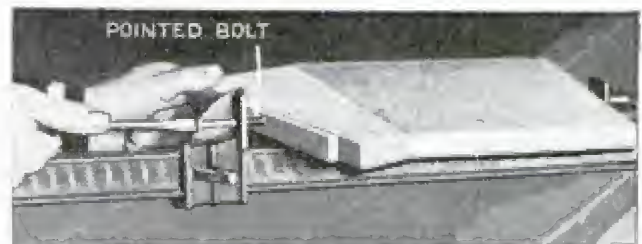
Circle cutters made from scrap pipe and tubing of various sizes can be used for decorative inlay work, for routing and for cutting dowels. The first two operations are done in a drill press while the latter is performed in a lathe. Just file teeth at one end of each pipe and the cutter is ready. Inasmuch as chucks on most drill presses will not accommodate pipe, you use a metal rod for a shank, pinned to the pipe with or without a bushing as may be necessary. Where circles are to be routed in straight lines to produce a uniform pattern, a fence is clamped to the drill-press table and the depth stop is set for  $\frac{1}{16}$  in. Spacing of the circles equidistantly is assured by penciled division marks on the fence and on the work, which are brought in alignment. A number of patterns may be formed by using small and large circles as shown in the upper left detail. Filling the circles with colored sealing wax or colored wood putty and sanding the surface flush with the wood, provides beautiful inlay effects. For dowel cutting, you first turn a hardwood block and bore a hole concentrically, the hole being just a trifle larger than the size of the desired dowel. The hole is counter-bored to form a snug seat for a short pipe cutter. The teeth should extend just be-

yond the face of the block. Pinning may be necessary. Square stock having a diagonal cross section slightly larger than the desired dowel size, is carefully fed through the cutter, which is attached to the lathe faceplate, mounted on a hollow spindle.

—Edwin M. Love, Monterey Park, Calif.

## Holding Beveled Work in Clamp

When clamping work that has one or both edges at a bevel, the tendency to slip out of the clamp can be prevented by using pointed bolts in the clamp jaws as in-



*Run the clamp jaws tightly against the work, then drive up the pointed bolts to bear against it*

dicated. The bolts are screwed into tapped holes, the pointed ends bearing against waste strips tacked to the edges of the work to avoid marring it.



## Hand Tools Are Marked Neatly with Numeral-Headed Nails

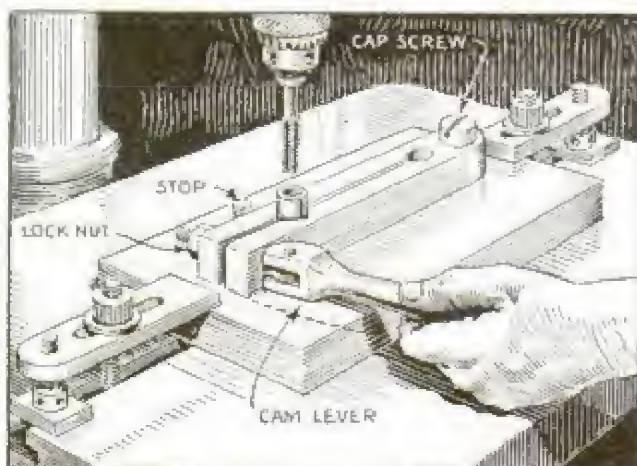


*Duplicate sets of tools in manual-training shop easily identified by numbered nails*

Instead of painting numerals on tools, which is common practice in school shops, one manual-training instructor used numeral-headed nails for numbering duplicate sets of planes, saws, hammers, etc. On tools that lack wooden parts in which to drive the nails, they can be attached easily to the metal by first drilling a pilot hole.

## Tapping Fixture for Small Parts

Designed to hold small round or square parts that are to be tapped lengthwise, this fixture grips or releases them by merely

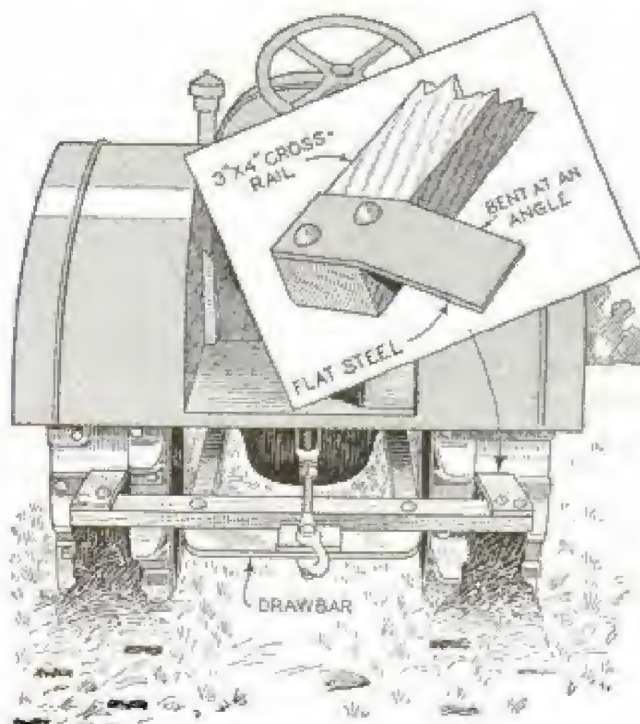


*Small work to be tapped in drill press is removed from this fixture by merely flipping a cam lever*

moving a cam lever. The body is a piece of tool steel which has two holes drilled an inch or so from each end, after which it is slotted as indicated. The body is mounted on a steel base with a heavy cap screw run through a third hole drilled at the rear end. A hole at the split end takes a bolt which has a lever cam on one end and a lock nut on the other. In use, the fixture is clamped to the drill-press table and the work is placed in the open hole nearest the split end, after which the cam lever is moved to pull the two sides of the body tightly against it.

## Lugs on Tractor Wheels Cleaned by Simple Scraper

Tendency of the lug wheels on his tractor to fill with dirt and greatly reduce

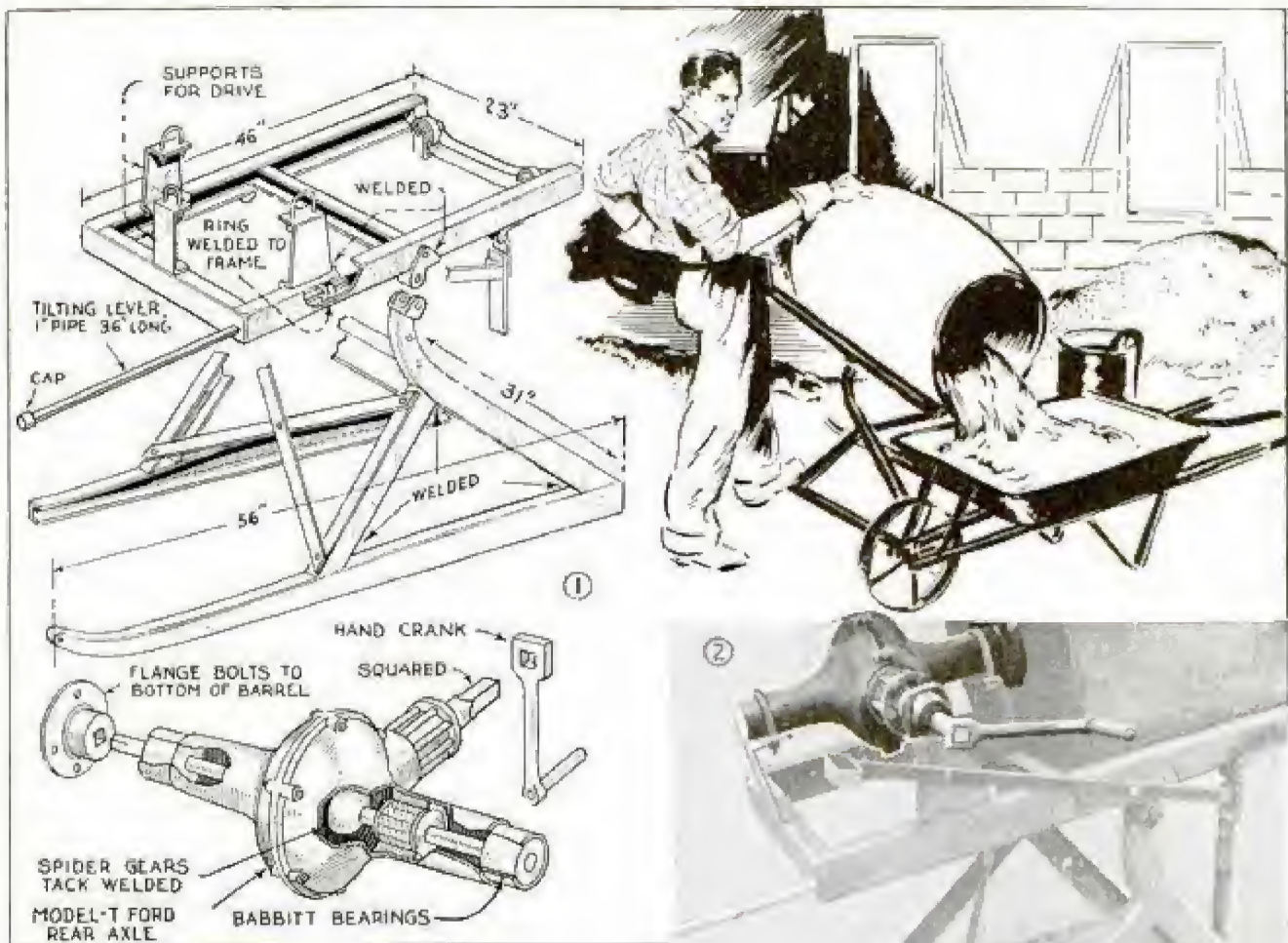


*Loss of traction by dirt-clogged lugs on tractor wheels prevented with this scraper*

traction, led one farmer to rig up this scraper. It is nothing more than a length of 3 by 4-in. wood stock with pieces of heavy flat iron bolted near the ends at right angles so that they project between the two rows of lugs on the wheels. In the original installation the scraper was bolted to the drawbar of the tractor. On tractors not fitted with a drawbar of this type the scraper can be attached to any part of the machine suitable for the purpose.



# Small Cement Mixer Has Geared Hand Crank



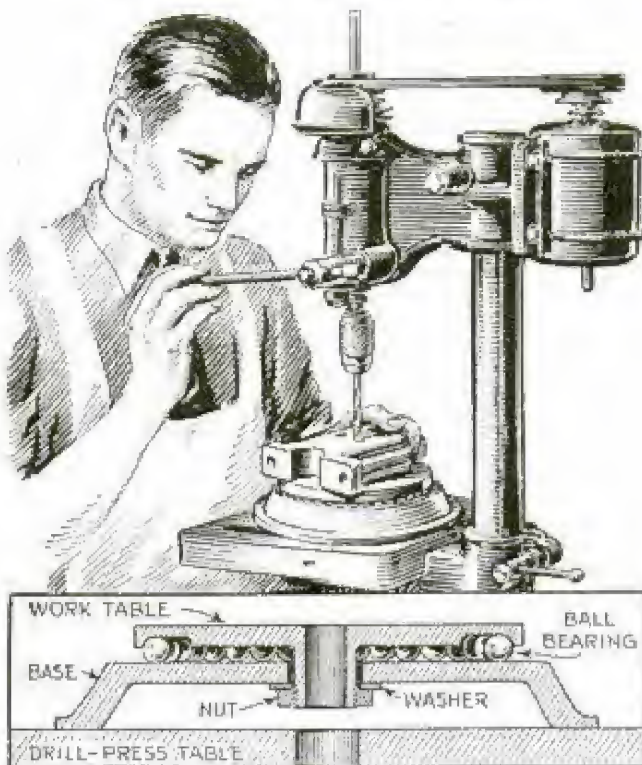
Auto parts and a 60-gal. barrel comprise this rotating cement mixer. Auto frames were cut and joined by welding. A section with the shackle ends forms the sled, and a similar section with shackles upturned, and suitably braced, supports the mixer frame which is pivoted as shown in Fig. 1. In Fig. 2 the frame is shown in the mixing position where it is held by means of a sturdy iron prop. This is pivoted to the frame and attached to a slotted handle which slides back and forth on two bolts so the prop can be moved on or off a small metal block welded to the inclined brace. To disengage the prop, first push down on the tilting lever, which is a pipe that can be slid under the drum when not used. A cut-off rear end is mounted concentrically in line with the drum. The cut-off drive shaft has a squared end to take a crank for turning the drum, which rests on two ball bearings at each end, Fig. 3. The chain shown here was originally used to hold the drum in the mixing position but the prop was found an improvement.

—Jos. C. Coyle, Yuma, Ariz.





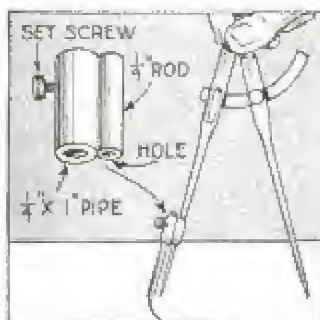
## Auxiliary Table on Drill Press Rotates Large Castings



*Ball-bearing table on drill press rotates work to drill hole accurately*

Drilling large castings and similar work can be done much more accurately if the work can be rotated slowly as the drill is fed into it, the slow rotation of the work tending to compensate to some extent for an incorrect drill, or any inaccuracy of the drill-press spindle in relation to the table. In order to rotate the work easily, an auxiliary table to turn on ball bearings was rigged up as indicated. The base of the table was cast and the top was turned on a lathe, leaving a neck in the center which was drilled through and threaded to take a washer and nut. A groove was turned in the underside to serve as a ball race.

## Attachment on Welder's Dividers to Hold Soapstone



Welders who use soapstone crayon for laying out work on metal to be cut with an acetylene torch, will find this holder handy for attaching the crayon

to one leg of dividers. A  $\frac{1}{4}$ -in. pipe nipple to hold the crayon is drilled for a set screw, and welded to a  $\frac{1}{4}$ -in. steel rod, drilled and filed to a taper to fit the dividers.

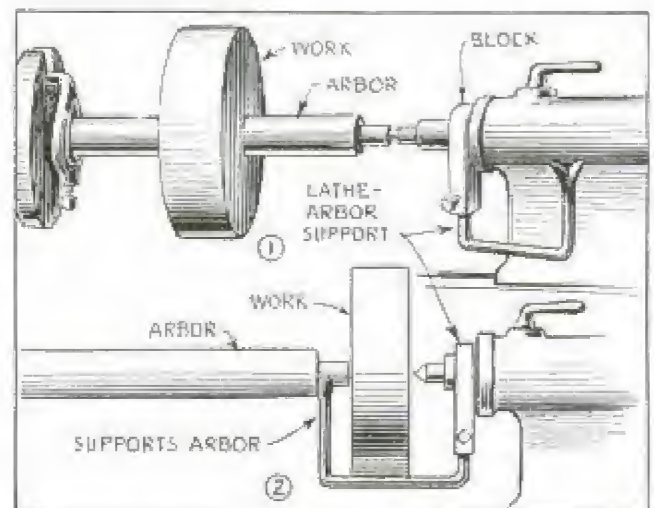
## Notched Leg Improves Calipers

Toolmakers and layout men who use hermaphrodite calipers will find that they can improve them considerably by merely notching the end of one leg. The leg of the calipers can then be drawn along any complicated pattern with less tendency to slip off, perhaps spoiling an otherwise good layout.



## Lathe Arbor Support Eases Work

To save the necessity of using a chain block or another man each time heavy work is changed in a lathe, one shop owner utilizes a novel arbor support. This consists of a steel block bored at one end to slip over the tailstock spindle and at the other end to take a wide, V-shaped rod, which is held with a set screw. The free end of the rod is split and bent to form a Y, as in Fig. 1. In use, the Y-shaped piece is swung around under the work to support the arbor end, as in Fig. 2, while the work is removed.



*Support swings around to hold lathe arbor while heavy work is removed single-handed*

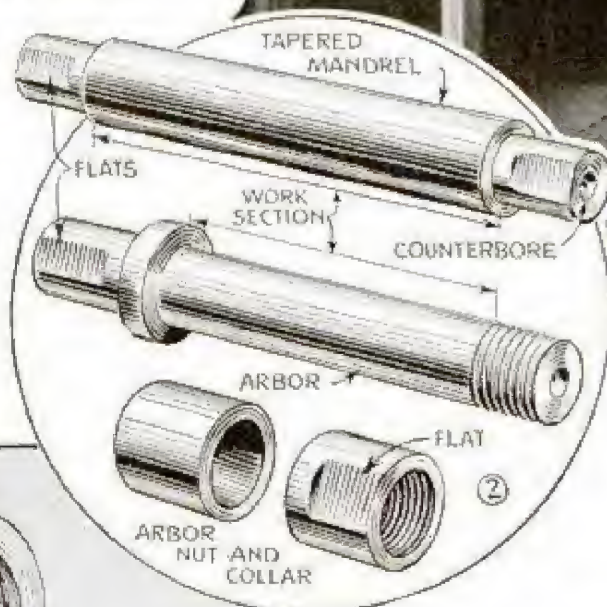
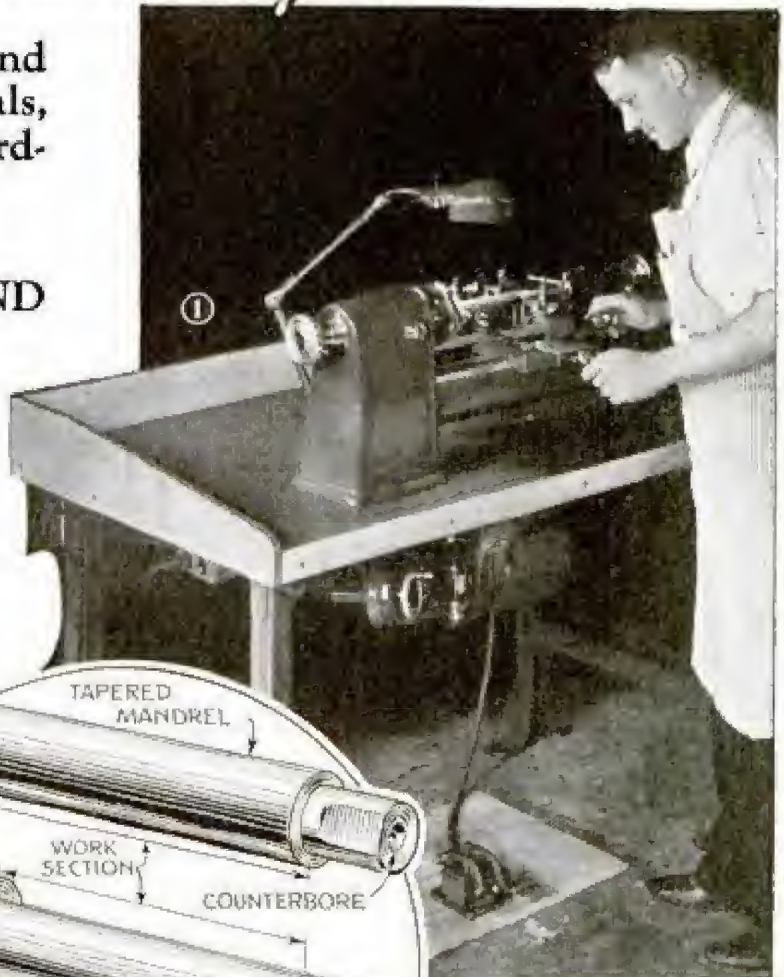


# Precision MACHINE TOOLS *turned on your lathe*

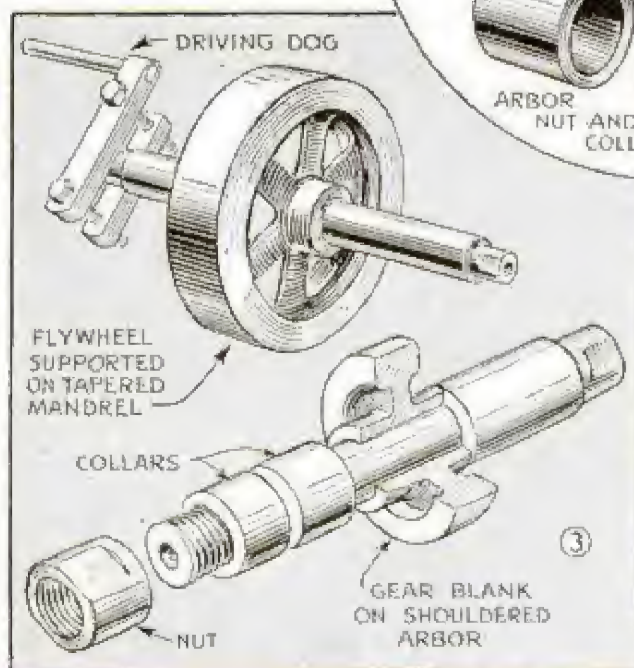
How to turn mandrels and arbors—selecting materials, machining, centering, hardening and grinding

By H. J. CHAMBERLAND

**J**UST as soon as you expand operations on your workshop metal-turning lathe beyond ordinary chuck and faceplate work you run squarely into the need for more machine-tool accessories. Among the very first you will require are precision mandrels and arbors, for without them you cannot well handle external machining operations on work that is precision-drilled and reamed to finish dimensions. Naturally, these tools are expensive to purchase outright. How-

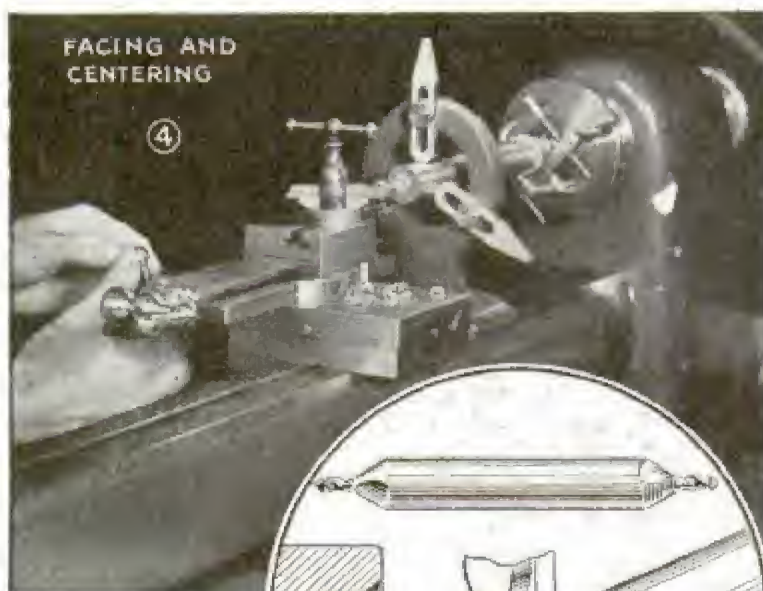


ever, your metal-turning lathe is a versatile machine and you can, with a bit of ingenuity, use it to make its own accessories.



Mandrels come in sets and there should be one set for standard bores and another set for work bored undersize and intended to be hardened and ground. The range should be from  $\frac{1}{4}$  in. to 1 in. in eighths of an inch or fourteen mandrels all told. The arbors should, of course, be of standard dimensions,  $\frac{3}{4}$  and 1-in. size are advisable to begin with although any other sizes may be made as required. Conventional mandrels, Figs. 2, 3, and 11, taper .0005 in. in each inch of length and the entering end is usually this amount under the actual size. As the total taper



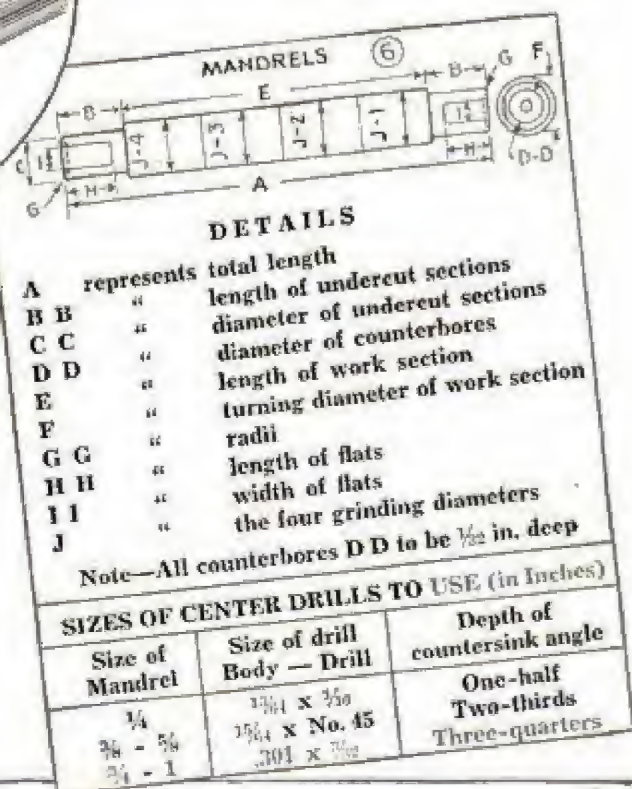
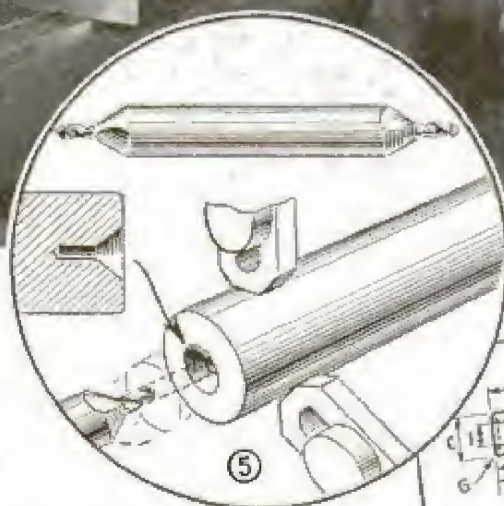


only amounts to .003 in. on a 6-in. length, it is difficult to accurately arrive at these measurements unless you have special equipment. Therefore, without sacrificing in the least the intended purpose of the tools, a new design has been adopted which makes it possible to get results identical with those derived from the standard procedure. The work length of each mandrel has been divided into four equal sections, each step increasing a predetermined amount, thus producing the required drive.

Arbors belong to the same tool family as mandrels but are of entirely different construction. Mandrels are intended to hold a single piece, whereas arbors can take several pieces of identical diameters and bores to be turned, milled or ground. Arbors have a wider range of applications and are usually termed gang or collar arbors, as they are threaded for nuts and have collars of various widths as components. Tool work requires good material, in this case first quality straight-carbon tool steel. However, keep in mind that with this steel, carbon predominates and varies as to the nature of the tools to be made. Fig. 8 lists the material required for the two sets of mandrels and gives the carbon content. Figs. 4 to 7 inclusive give

the machining data and size of the combination center drill to use. Note particularly that the table, Fig. 7, is continued in Fig. 10 and that the letter operations refer back to the blanket sketch and the details in Fig. 6. Likewise Figs. 12 to 17 inclusive give the machining data for two styles of arbors.

Assuming that the material is at hand and regardless which size mandrel or arbor is to be machined first, a full-scale drawing of the part should be made by replacing each letter with its corresponding dimension, as taken from tables in Figs. 6 and 7. The



MANDRELS—All dimensions in inches ⑦

Size of mandrel as marked	Letter operation		Face	Turn	Face	Turn	File
	Face	Turn					
$\frac{1}{4}$	A	BB	CC	DD	E	F	GG
$\frac{1}{4} - .006$	$3\frac{1}{4}$	$\frac{3}{8}$	$\frac{7}{16}$	None	$2\frac{1}{2}$	.256	$\frac{1}{16}$
$\frac{3}{8}$	$3\frac{1}{4}$	$\frac{5}{8}$	$\frac{7}{16}$	None	$2\frac{1}{2}$	.250	$\frac{1}{16}$
$\frac{3}{8} - .006$	$4\frac{1}{4}$	$\frac{5}{8}$	$\frac{9}{16}$	None	3	.381	$\frac{1}{16}$
$\frac{1}{2}$	$4\frac{1}{4}$	$\frac{5}{8}$	$\frac{9}{16}$	None	3	.375	$\frac{1}{16}$
$\frac{1}{2} - .008$	5	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{1}{4}$	$3\frac{1}{2}$	.508	$\frac{1}{16}$
$\frac{3}{4}$	5	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{1}{4}$	$3\frac{1}{2}$	.500	$\frac{1}{16}$
$\frac{3}{4} - .008$	$5\frac{1}{2}$	$\frac{3}{4}$	$\frac{9}{16}$	$\frac{5}{16}$	$3\frac{3}{4}$	.633	$\frac{1}{16}$
$1$	$5\frac{1}{2}$	$\frac{7}{8}$	$\frac{9}{16}$	$\frac{5}{16}$	$3\frac{3}{4}$	.625	$\frac{1}{16}$
$1 - .010$	6	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{3}{8}$	$4\frac{1}{4}$	.758	$\frac{3}{16}$
$1 - .008$	6	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{3}{8}$	$4\frac{1}{4}$	.750	$\frac{3}{16}$
$1\frac{1}{2}$	$6\frac{1}{2}$	1	$\frac{3}{4}$	$\frac{5}{16}$	$4\frac{1}{2}$	.885	$\frac{1}{16}$
$1\frac{1}{2} - .010$	$6\frac{1}{2}$	1	$\frac{3}{4}$	$\frac{5}{16}$	$4\frac{1}{2}$	.875	$\frac{1}{16}$
2	7	1	$\frac{3}{4}$	$\frac{1}{2}$	5	1.010	$\frac{3}{16}$
2 - .010	7	1	$\frac{3}{4}$	$\frac{1}{2}$	5	1.000	$\frac{3}{16}$



**MATERIAL REQUIRED FOR  
BOTH SETS OF MANDRELS**

Carbon Content—1.00 - 1.09

Number of Pieces	Length in Inches	Diameter in Inches
1	7 $\frac{5}{8}$	$\frac{3}{8}$
1	8 $\frac{5}{8}$	$\frac{1}{2}$
1	10 $\frac{1}{8}$	$\frac{5}{8}$
1	11 $\frac{1}{8}$	$\frac{3}{4}$
1	12 $\frac{1}{8}$	$\frac{7}{8}$
1	13 $\frac{1}{8}$	1
⑧ 1	14 $\frac{1}{8}$	1 $\frac{1}{8}$



only important dimensions are the decimal ones as the others add nothing to the accuracy value of the tools. However, the closer you hold the fractional sections, the better.

**Centering:** This is the initial step and it is an important one. Mandrels and arbors, unlike shafts, spindles and other parts only centered to be machined, revolve on their centers during their entire life. This is ample reason why in this case center holes and bevels should be substantially larger than with regular work. While the combination drill need not be exactly the size recommended in Fig. 6, the countersunk section should be in proportion to the diameter.

**Turning:** Turning operations on the tools, both mandrels and arbors, are ordinary procedure and simple. However, all decimal dimensions should be held close, due to threading and grinding require-

ments. The finish of these sections should be smooth even if emery cloth has to be used, and the turning should also be straight even if filing has to be done. Relative to a T-style arbor, Fig. 12, there is some unavoidable waste of material on account of a long work length as compared to style S which has a much shorter work surface. Fig. 1 shows the turning of the combined work and threaded sections. It is evident that the work section of arbors can be of any reasonable length to suit the requirements.

**Counterboring the Ends:** This operation is very essential, especially with mandrels, as it is intended to protect the centers from injury. It is represented by the letters D D in the table, Fig. 6, and also by I I in Fig. 13, and is illustrated in Fig. 4 which shows the usual set-up. The operation can be done at any time providing the tools have been either roughed or finish-turned.

The operator should bear this in mind when centering the tools and make an allowance for both counterboring and facing. Or, you can usually do the three operations in sequence as in Fig. 4, face, center and counterbore.

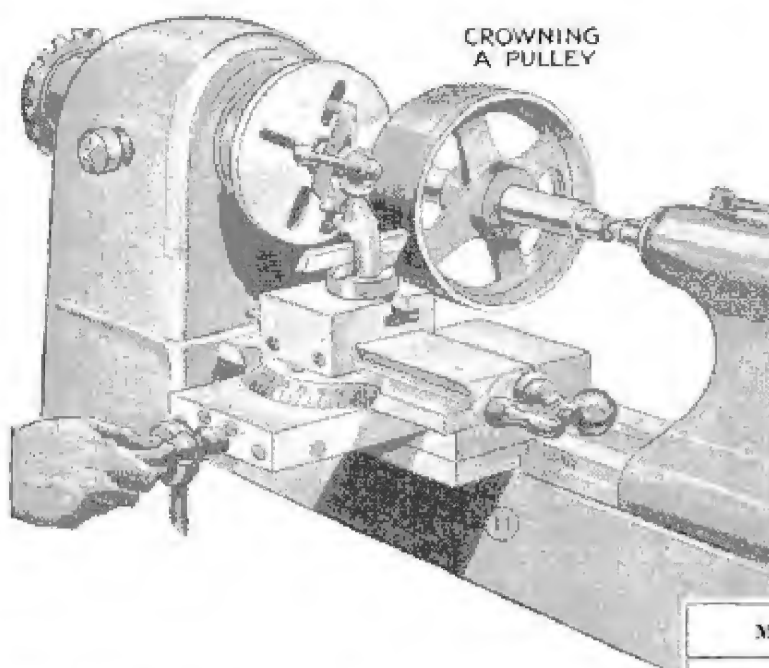
**Threading:** When a lathe is not screw-cutting, threading arbors and arbor nuts must necessarily be done with a die and tap. To thread the arbors the procedure is no different in this case than others, namely, by holding the die stock against a flat drill pad in the tailstock spindle. It is advisable to chamfer the end of the work

**MANDRELS—All dimensions in inches**

⑩

Size of mandrel as marked	Letter operation					
	Mill		Grind			
	HH	II	J 1	J 2	J 3	J 4
$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$	.250	.2505	.251	.2515
$\frac{1}{4}$ —.006	$\frac{1}{2}$	$\frac{1}{4}$	.244	.2445	.245	.2455
$\frac{3}{8}$	$\frac{3}{2}$	$\frac{3}{4}$	.375	.3755	.376	.3765
$\frac{3}{8}$ —.006	$\frac{3}{2}$	$\frac{3}{4}$	.369	.3695	.370	.3705
$\frac{1}{2}$	$\frac{5}{2}$	$\frac{3}{2}$	.500	.5005	.501	.5015
$\frac{1}{2}$ —.008	$\frac{5}{2}$	$\frac{3}{2}$	.492	.4925	.493	.4935
$\frac{5}{8}$	$\frac{3}{4}$	$\frac{5}{4}$	.625	.6255	.6265	.627
$\frac{5}{8}$ —.008	$\frac{3}{4}$	$\frac{5}{4}$	.617	.6175	.6185	.619
$\frac{3}{4}$	$\frac{3}{4}$	$\frac{5}{4}$	.750	.7505	.7515	.752
$\frac{3}{4}$ —.008	$\frac{3}{4}$	$\frac{5}{4}$	.742	.7425	.7435	.744
$\frac{7}{8}$	$\frac{7}{4}$	$\frac{7}{4}$	.875	.8755	.8765	.877
$\frac{7}{8}$ —.010	$\frac{7}{4}$	$\frac{7}{4}$	.865	.8655	.8665	.867
1	$\frac{7}{4}$	$\frac{7}{4}$	1.000	1.0005	1.0015	1.002
1—.010	$\frac{7}{4}$	$\frac{7}{4}$	.990	.9905	.9915	.992





slightly so as to give the die a concentric start. The outer edge of the bore is next chamfered and the sides faced in the intended location. While the flats on mandrels and arbor nuts call for a milling operation, it can also be done by roughing in the grinder and filing carefully. Of course, a milling attachment, Fig. 14, is best for such jobs.

**Collars:** These are easily made from seamless steel tubing. A simple cutting-off operation followed by chamfering the bores, and filing the corners completes the job. The sides are sure to be parallel, and turning and boring is entirely eliminated. Chamfering can easily be done with a hand scraping tool as in Fig. 18. As the next step is hardening, tools should now be stamped with their respective sizes unless it is planned to etch them after grinding.

**Hardening:** Obviously, the life of any metal-working tool depends on its particular degree of hardness to resist wear. This degree of hardness in turn depends on the analysis of the steel, the temperature to which it is heated and the method by which it is cooled or, better said, quenched. The critical temperature, known as the point of recalcence, is the temperature at which the steel will harden best. With carbon tool steel it varies as to the carbon content, the more carbon, the less heat required. Depending on the quality of the steel, this variation is from 1450 degrees F., as high, to 1238 F., low. These figures are relative to 1.00-1.30 carbon content.

Next to correct temperature comes the quenching medium. In this case water is best. The bath container should hold at least five gallons of rain water, and the addition of table salt, 2 lbs., gives better results. No time should be lost between taking the parts from the heating chamber, Fig. 9, and dipping them into the bath. The tools should be immersed in as near a vertical position as possible. The degree of warpage or distortion will usually be equivalent to the error. Such errors cannot be avoided altogether and

#### MATERIAL REQUIRED FOR BOTH ARBORS

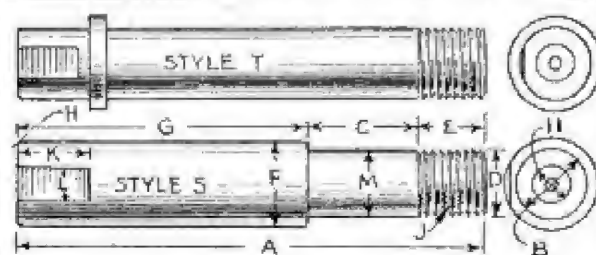
##### ARBORS

Material	Number of pieces	Length in inches	Diameter in inches
Use same	1	5 $\frac{1}{16}$	1 $\frac{1}{16}$
steel as	1	6 $\frac{1}{16}$	1 $\frac{1}{16}$
for	1	1 $\frac{1}{16}$	1 $\frac{1}{16}$
mandrels	1	1 $\frac{1}{16}$	1 $\frac{1}{16}$

Note—If you prefer, you may order but two pieces and cut off sections for nuts

##### COLLARS

Material	Number of pieces	Length in inches	Diameter in inches	Bore in inches
Seamless steel tubing	1	2	1	$\frac{3}{4}$
	1	2	1 $\frac{1}{4}$	1 (12)



#### COMPLETE ARBORS

##### Details

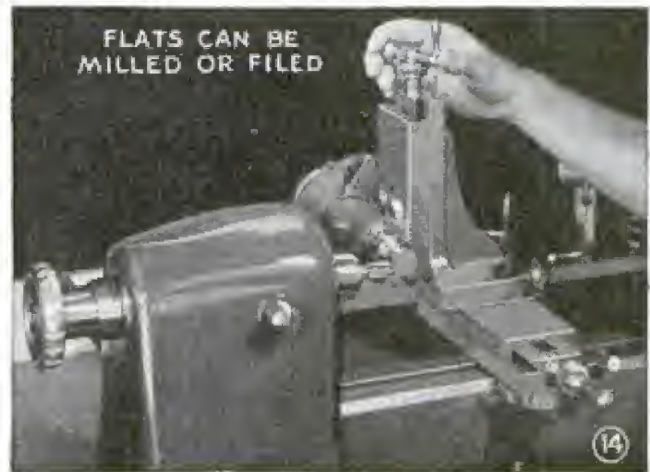
A	represents total length
B	" turning dia. of work section
C	" length of work section
D	" turning dia. of thread section
E	" length of thread section
F	" turning dia. of body
G	" length of body
H	" radius
I	" counterbore on ends
J	" thread
K	" length of flat
L	" width of flat
M	" grinding dia. of work section

Note—Use same center drill as for corresponding size mandrel

(13)



the parts should be straightened if necessary. This may be done by heating with a blowtorch at the proper location and striking the high spot with a hammer. Or the tool can be straightened in an arbor press. If .010 in. has been allowed for grinding, the eccentric error should be under .005 in. or grinding will not produce a concentric surface. All steels should be quenched at their lowest critical temperature to avoid brittleness. The bath should be kept at a temperature of 85-95 degrees F. With no pyrometer or thermocouple facilities, one must depend on the eye to observe the variation in colors during the heating process. The tools in question should be



quenched quickly when reaching a dark red. The collars, being machinery steel, can be quenched at a lighter color in a hot cyanide-of-potassium bath.

**Grinding:** As soon as the tools have been hardened, remove the scale from all surfaces with fine emery cloth by speeding in the lathe. Be especially particular with the center holes as they should be polished to a very fine finish. The grinding operation is nothing to be concerned about although accuracy does depend on this operation. Toolpost grinding equipment is comparatively inexpensive to buy, considering the good work it does. However, you can make your own. Grinding equipment, such as in Fig. 19, can often be made from discarded machinery parts. Whatever the set-up for external grinding where no coolant is used, the grinding wheel should be preferably of the so-called cut-off composition, medium grade and grain. The wheel should be about 4 in. in diameter with a  $\frac{1}{8}$ -in. face, its surface speed should not be less than 4,500 f.p.m. nor more than 5,000 f.p.m. As for grinding the mandrels, the entire work section should be first trued cylindrically and straightened by making necessary adjustments on the lathe. The surface can then be given a coat of Prussian blue and the length divided into four equal parts as near as possible. This is best done with a pencil mark. As in the table, Fig. 6, section J-1 should be finish-ground first, and then the others in order. Section J-1 should be slightly undersize rather than over so as not to bind the work as it is pressed on. If the finish is not satisfactory, it is advisable to leave all dimensions slightly oversize, say .0001 or .0002 in. and polish to size with fine emery cloth. The feed should not be over

ARBORS—Continued								(15)
All dimensions in inches								
Size of arbor as marked	Letter operation		Turn					
	Face		Turn					
	A	B	C	D	E	F	G	
3/4	5 3/4	.760	1 1/2	.750	1	1	3 1/4	
1	6 3/4	1.012	2	1.000	1	1 1/4	3 3/4	
	File	Face	Thread	Mill	Grind			
	H	II	J	K	L	M		
3/4	3/4	3/8	3/4-10 U.S.S.-R.H.	1	3/8	.750		
1	7/8	1/2	1-8	1	1/2	1.000		
Note—If lathe is screw-cutting, a finer thread is usually given the preference								

ARBOR NUTS	
Details	
A	boring dia.
B	thread
C	width of chamfer
D	width
E	turning dia.
F	radius
G	length of flats
H	width of flats

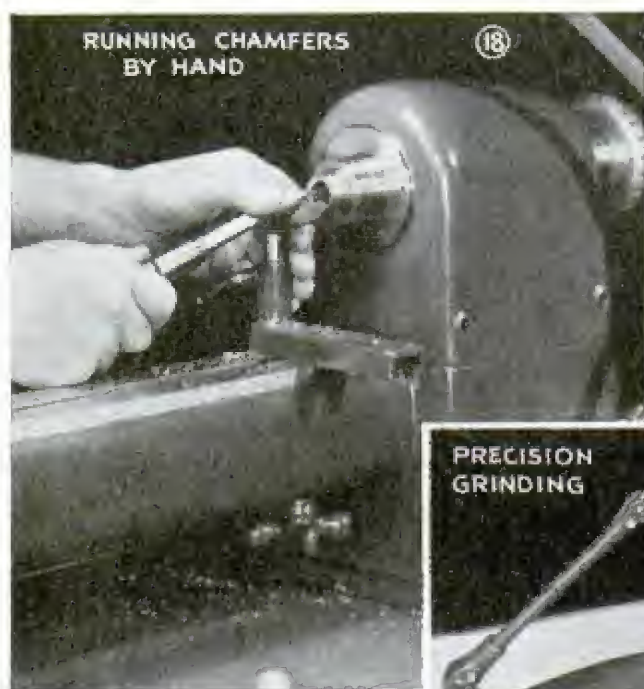
The diagram shows a technical drawing of an arbor nut. It consists of two views: a front view on the left and a top view on the right. The front view shows a rectangular block with a central square hole. Dimension A is the outer diameter, B is the thread diameter, C is the width of the chamfer on the top edge, D is the width of the block, E is the diameter of the turning (flange), F is the radius of the fillet at the base of the turning, G is the length of the flats on the central hole, and H is the width of the flats. The top view shows the circular profile of the nut, with the central hole and the turning diameter E clearly marked.

Arbor size	Letter operation	All dimensions in inches						
	Bore	Thrd.	Form	Face	Turn	File	Mill	
	A	B	C	DD	E	F	G	H
$\frac{3}{4}$	$\frac{5}{8}$	$\frac{3}{4}$ -10	$\frac{1}{16}$	1	1	$\frac{15}{16}$	$\frac{3}{4}$	$\frac{7}{8}$
1	$\frac{31}{32}$	1-8	$\frac{3}{16}$	1	1 $\frac{1}{4}$	$\frac{1}{16}$	$\frac{3}{4}$	$\frac{7}{16}$

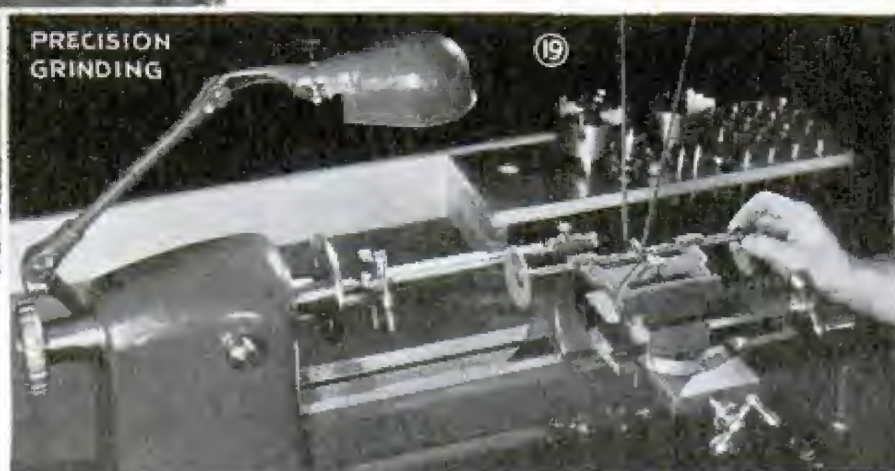
ARBOR COLLARS	
Details	
A	—diameter (original, polish only)
B	—bore (original)
C	—cut-off (widths to suit)
DD	—chamfer (form $\frac{1}{16}$ in. wide)
EE	—radii (file $\frac{1}{16}$ in.)
F	—grind (plus .003)

The diagram shows a technical drawing of an arbor collar. It includes a side view on the left and an end view on the right. The side view shows a rectangular block with a dashed line indicating a bore of diameter B. The width of the block is labeled C. The end view shows a circular cross-section with an outer diameter A and an inner bore diameter B. A chamfer of width DD is shown at the edge of the bore. Radii EE are indicated on the outer and inner surfaces. A ground surface F is indicated on the outer diameter. A dimension E is shown for the thickness of the collar. A circled number 17 is in the upper right corner.





.0005 in. for each traverse movement and the latter should be very slow so as not to generate any heat. Other sections of the tools need not be ground. The grinding wheel should be dressed often to keep it in perfect balance. Fig. 19 shows grinding of the S-style, 1-in. arbor. In this case it is important that the side of

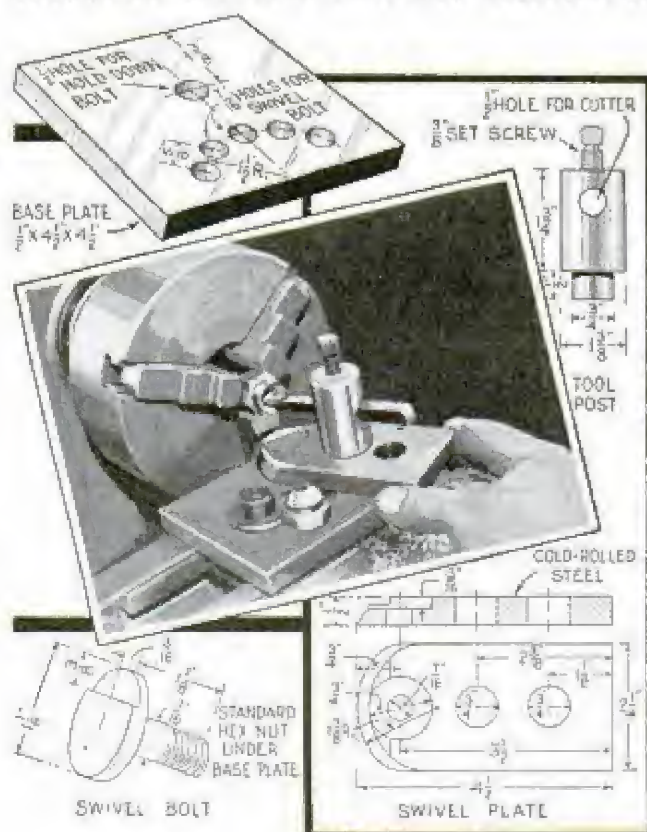


the wheel contacts the shoulder to square it with the work surface. As noted in Fig. 17, bores of the collars have to be ground .003 in. larger than their actual size to avoid lateral errors.

Before you attempt precision turning and grinding check over your lathe thoroughly. Test alinement of centers and check headstock bearings for both looseness and end play. Vibration imparted to the lathe through the drive belt from a

countershaft or due to a springy, uneven floor will make it difficult to work within specified limits. Should such conditions exist, they must be corrected.

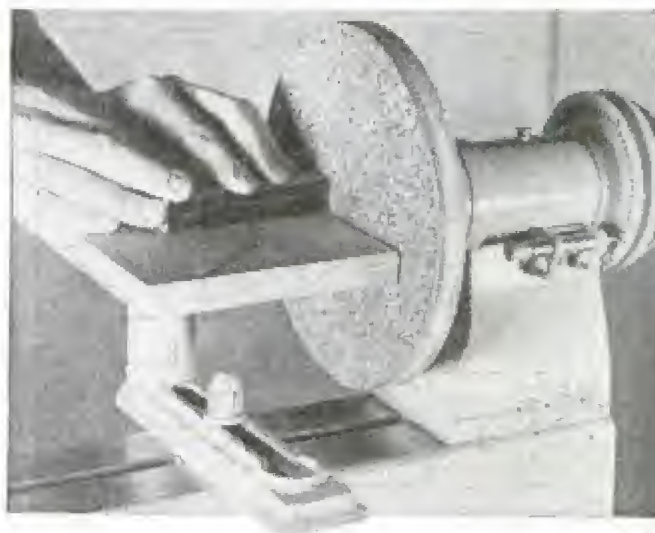
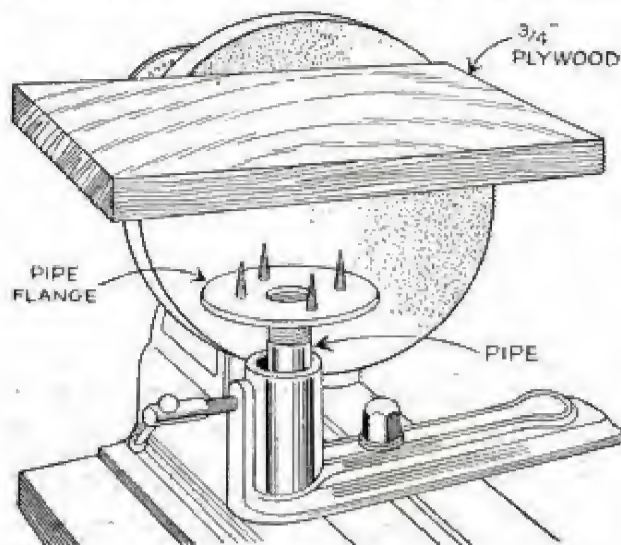
## Swivel Tool Post on Lathe Simplifies Radius-Turning Jobs



Turning duplicate radii, either concave or convex, within narrow limits is a simple job with this swivel tool post made from cold-rolled stock. It is mounted in the T-slot of the compound slide rest, which is turned 90 degrees or parallel to the ways of the lathe, so that the screw can be used to regulate the depth of the cut. For concave cuts, the device is adjusted so that when the swivel arm, holding the tool post, is swung from side to side, with the fingers, the cutter will describe an arc ahead of the swivel point. For convex cuts, the adjustment is just the reverse, the arc described being behind the swivel point, in which case the tool post is moved to the rear hole. Shims between the base plate and the top of the T-slot regulate the height of the cutter. Keeping the swivel bolt and the top of the base plate well oiled will make for easy operation. The drawings give construction details and dimensions.—R.G. Bullard, Monterey Park, Calif.



## Lathe Sanding Table Fits Toolpost Holder

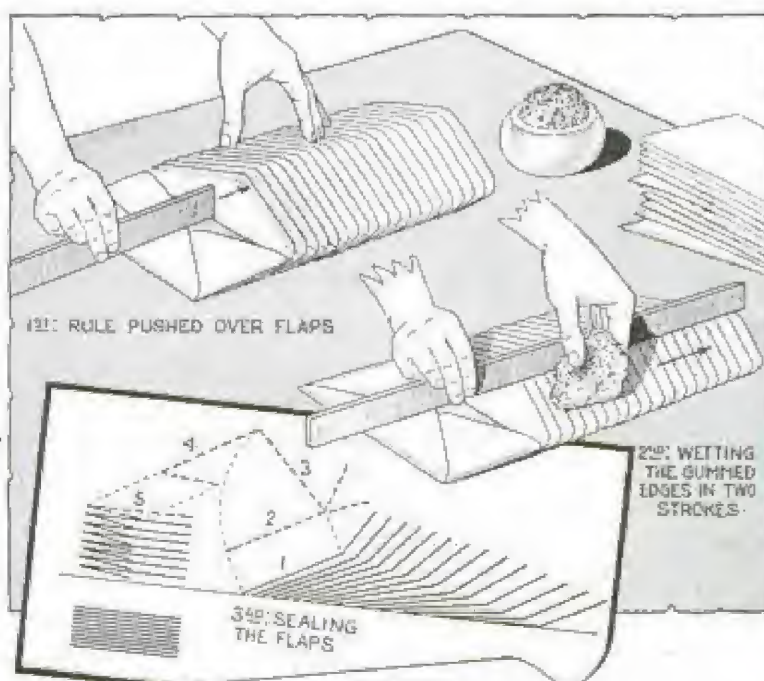


When squaring up small pieces of stock on a lathe sanding disk it is very often an advantage to have a table that can be adjusted easily and quickly to the best working height in relation to the disk. Made from a piece of plywood of a convenient

size, a short length of pipe and a flange, you have a table that is adjustable both vertically and horizontally. The toolrest base forms the holder, and the sanding table is held in the desired position by simply running up the clamp screw.

## Trick of Quickly Sealing a Number of Envelopes By Hand

Owners of small shops and stores who occasionally have a number of envelopes to seal, but have no machine for the job, can save time by hand-sealing them as follows: Bunch a number of them and then spread them as indicated in the first position of the drawing. Push a ruler, edge down, over the flaps, using one hand to keep them from slipping. Then wet the gummed edges with a couple of strokes of a wet sponge and lift the ruler straight up. To close the flaps, turn over each envelope as indicated by steps 1 to 5 and stack it, flap down, on a pile, applying pressure before the gum dries.



## Wood Impregnated with Arsenated Petroleum Oil Is Safe from Rot

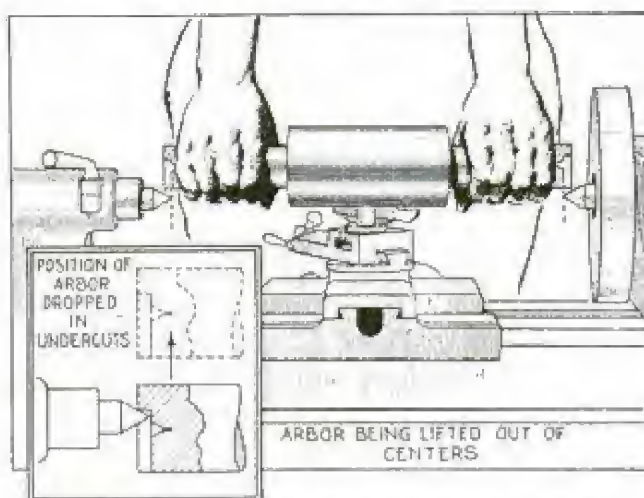
Arsenated petroleum oil has been found a good substitute for coal-tar creosote to protect wood against fungi or wood-boring insects. The oil costs much less than creosote, and is prepared by mixing arsenous chloride, 1 lb., and diphenylamine, 1 lb., with fuel oil, 42 gals. When wood is im-

pregnated with the mixture, it is poisonous to insects and the pores are sealed against the penetration of moisture, which is necessary for the growth of fungi. The work can be dipped in the liquid or the latter can be applied with a large brush.

—G. M. Wood, New York.



## Heavy Arbor Grooved at Ends Easily Lifted from Lathe

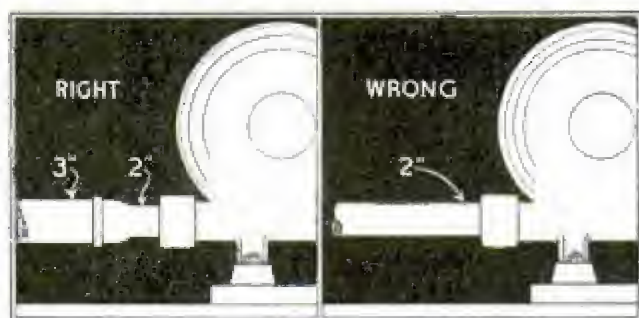


*Grooved ends of this arbor permit it to be set between centers with both hands*

Arbors too heavy to lift with one hand while loosening the tailstock with the other one, can be removed from the lathe single-handed if V-grooves are cut in the ends as indicated. When taking the arbor out, I have these V-grooves at the bottom and loosen the tailstock until the arbor falls into the undercuts. Then I lift it off the centers. Similarly, when putting it back, I drop it down the grooves until it is resting on the undercuts, and then adjust the tailstock.—H. Moore, Leeds, England.

## Delivery Pipe from Water Pump Must Be Larger Than Outlet

Modern centrifugal pumps have been improved to such an extent that the pipe fitter, who uses a discharge pipe of the same diameter as the pump outlet, often finds that the velocity of the liquid discharged is greatly above that originally determined before installing the pump. One reader claims he has found it best to install a discharge pipe 1 in. larger in di-

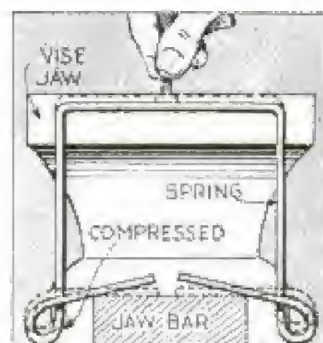


*Increasing size of discharge pipe on centrifugal pump reduces velocity and saves on cost of power*

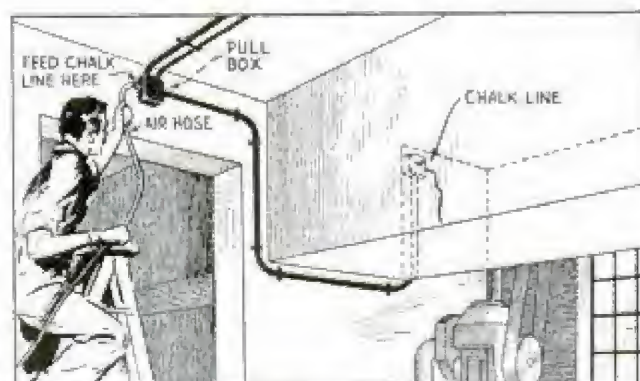
ameter than the outlet, as shown in the left-hand detail. Of course, this increases the initial cost, but the latter is soon written off by the saving in power.

## Spring Ejector on Bench Vise to Handle Small Parts

Screws, pins, etc., that are difficult to insert or remove from a vise are easily handled with this spring ejector. Bent from spring wire to the shape indicated, the spring rests between the vise jaws just a fraction of an inch below their top surfaces. In use, the jaws of the vise are turned up close so that the work will just pass between them. Then it is pressed down tightly to slightly compress the spring, and the jaws are tightened. When the screw is to be removed, loosen the jaws and the spring will push it out.



## New Wire Installed in Conduit with Aid of Air Hose



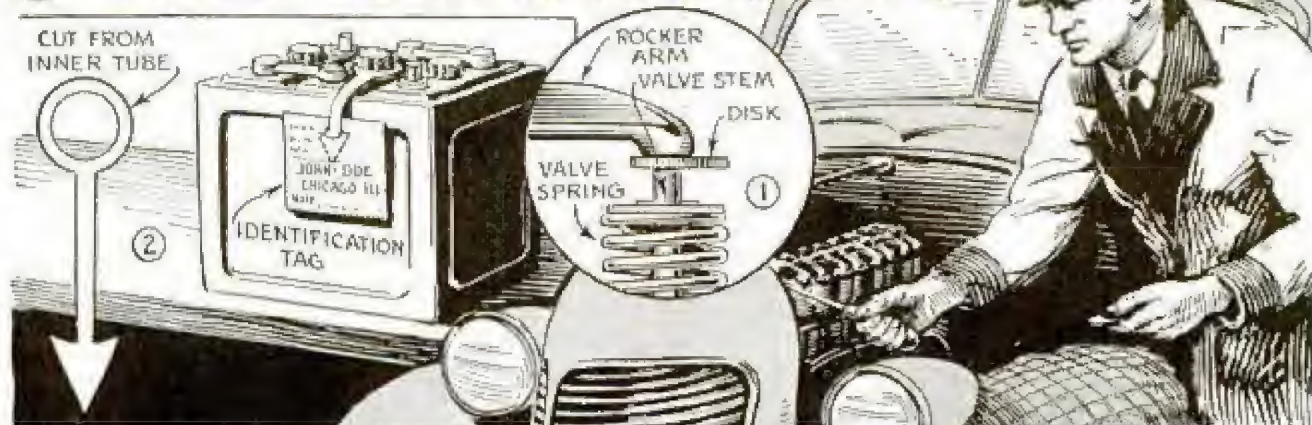
*Chalk line blown through crooked conduit with compressed air aids in rewiring building*

On a job of installing heavier electric wires in a building, a light chalk line was started through the conduit and then blown through it with the aid of compressed air. Then the steel fishing tape was tied to the line and pulled back through the conduit, after which the wires were tied to the steel line and pulled through the conduit without any trouble.

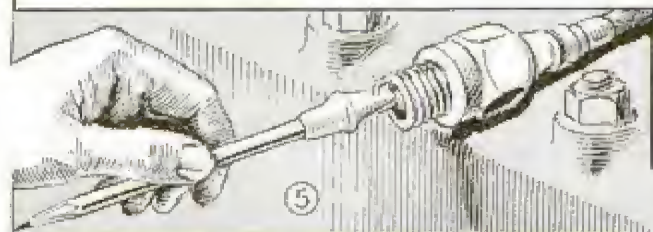
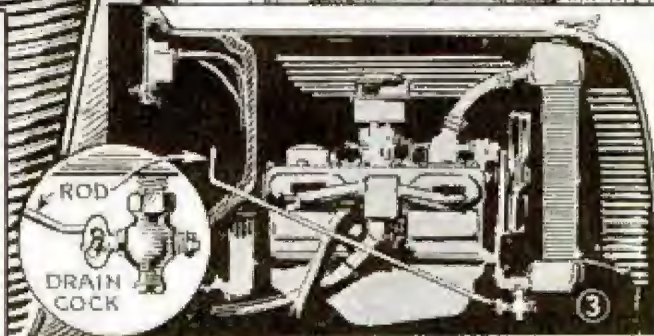
—William Gearhart, Sr., Walton, W. Va.



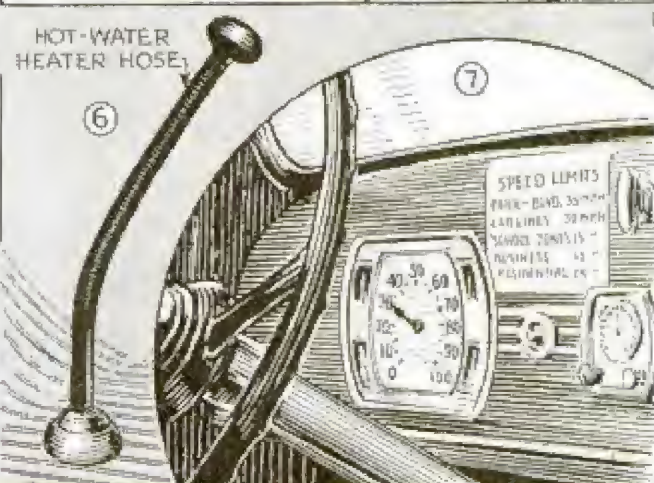
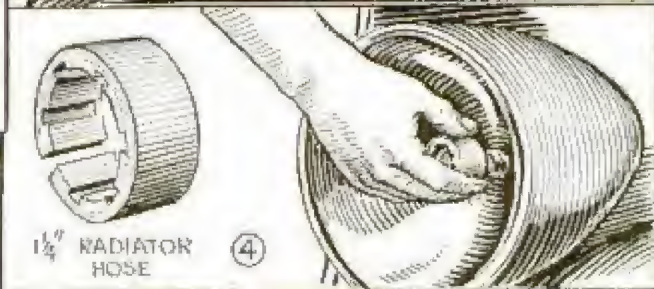
# Auto SHORTCUTS



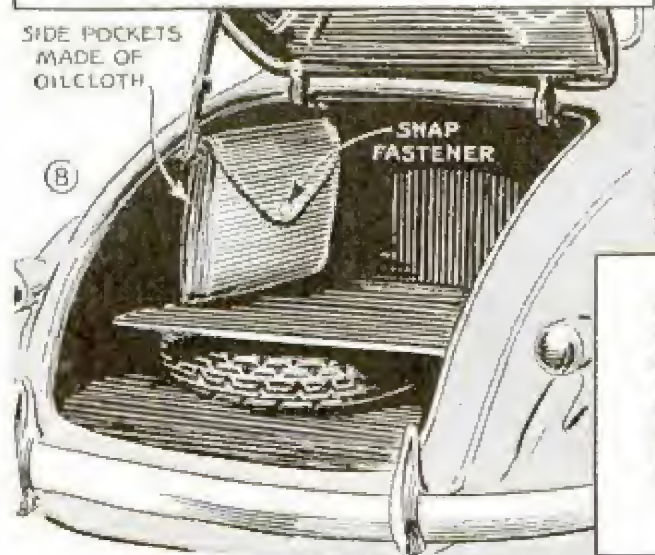
1, Compression of overhead-valve motor released to rotate crankshaft while working on bearings by inserting washers between rocker arms and valve stems. 2, Rubber arrow slips over battery post to hold identification card on battery left in garage for repairing or charging. Motorists who do not use anti-freeze solutions in winter will find the idea shown in 3 convenient as they can drain the radiators without raising the hood. A small iron rod is attached to the drain cock to extend through a hole in the dash behind the motor. The projecting end of the rod is bent at right angles to provide a grip



Piece of radiator hose grooved on inner surface, 4, to remove head lamps safely. 5, Short circuit in spark plug shows up if eraser is inserted between points while motor is cranked

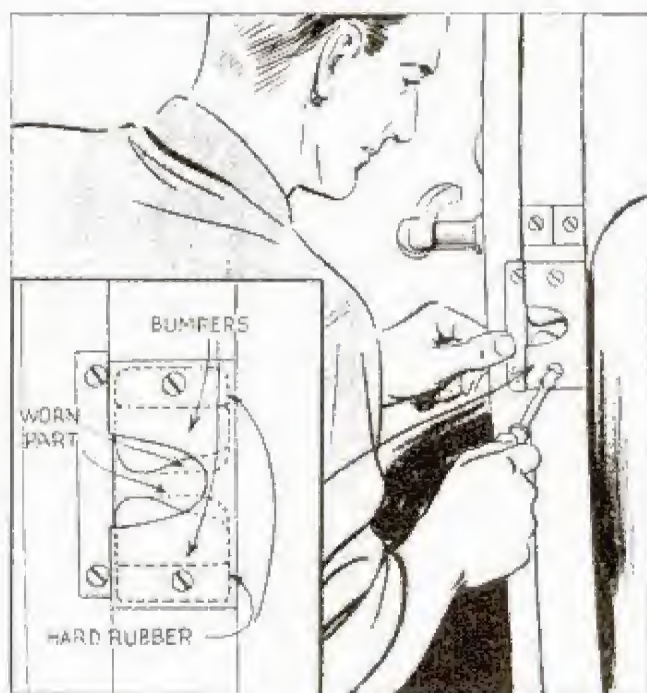


6, Hose slipped over gear-shifting lever tends to silence noise, which it transmits from transmission to interior of car. Speed limits of various streets in your home town, copied on paper and mounted on the instrument panel as in 7, show at a glance how fast you can drive. Large oil-cloth pockets made similar to a lady's purse and fastened to the lining of a luggage compartment, as in 8, provide storage for small articles





## Car-Door Bumpers Interchanged to Stop Rattling



*Remove plate over bumpers and turn them around, bringing unworn surfaces into contact with striker*

When a door on my car began to rattle, I removed the plate over the metal bumpers on the door frame and interchanged them, placing the bottom one on top. This put the worn ends of the bumpers at the rear, and brought the unworn surfaces in contact with the striker on the door, which stopped the noise.

—B. G. Wicks, South Easton, Mass.

## Hints to Remember in Checking Over Your Car

The following hints may help when checking over the mechanical condition of your car: If the points of a spark plug burn away or "whisker," the trouble may be that they are made of unsuitable material, are too thin, or that the motor is too "hot" for that particular style of plug. A weak fuel mixture is also likely to cause this trouble. The acid level in a storage battery should be checked at least once every two weeks if considerable driving is done, and the tops of the cells should be kept dry, or electrical leakage will occur. A lamp bulb that fails to give the same illuminating power as before may not be due to a run-down battery, but to vibration causing the filament to sag out of cen-

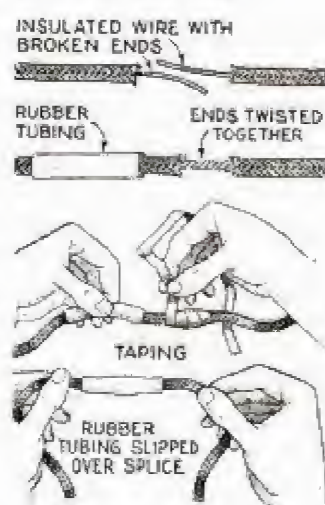
ter with the reflector. As lamp reflectors are easily scratched, they should be polished with a soft chamois moistened with gasoline and dipped in rouge powder. If the tips of the contact-breaker points become completely burnt off, repeatedly filing the ends of the steel screws bright will enable you to get home or to the nearest service station. When pulling new points or reconditioning old ones, be sure that they close properly. They should contact over the entire area of the faces, otherwise difficult starting, misfiring, and burning will result. When the points burn to a yellowish or whitish appearance it indicates condenser trouble.

## Reverse Gas Filter Gasket After Cleaning

After taking apart a gasoline filter to clean it, trouble is often encountered by having air leak into the filter because continuous pressure of the edge of the filter bowl has formed an irregular surface, or ridge, on one side of the cork gasket. This trouble can be prevented by simply turning the old gasket over, before reassembling the filter, so that the flat side is placed in contact with the bowl edges.

## Splice in Low-Voltage Wire Insulated with Tubing

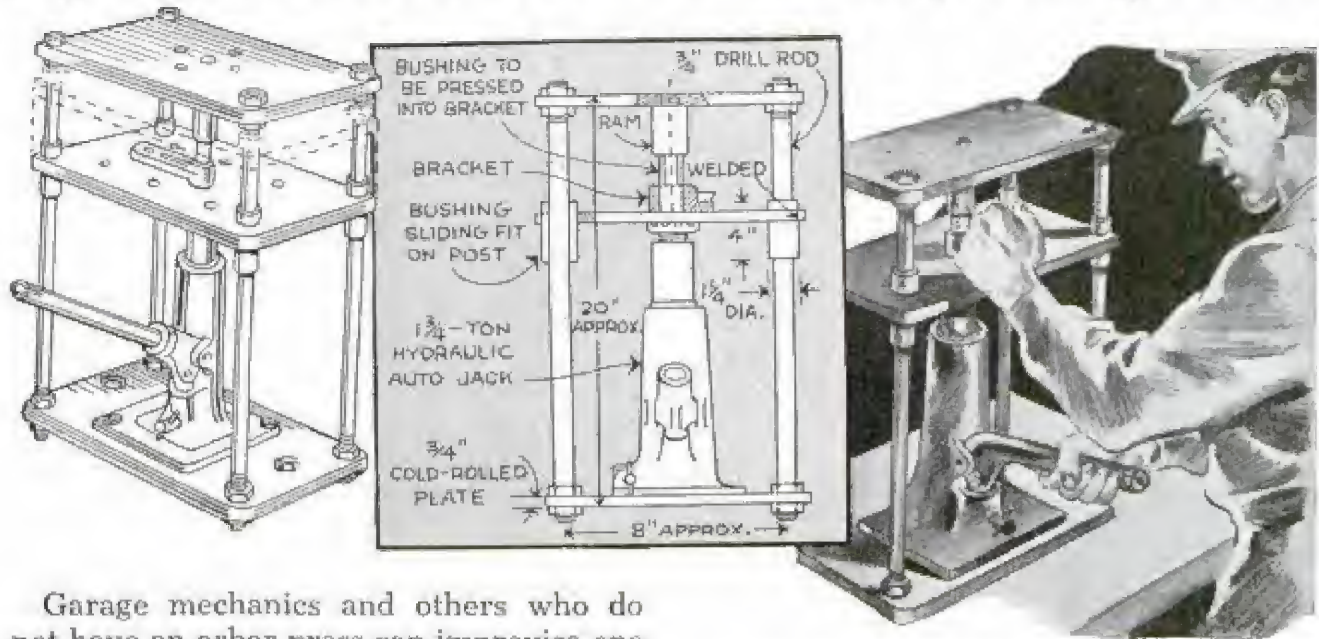
Wires carrying low voltage, such as those in the electrical circuit of a car, are quickly spliced and insulated with a piece of rubber tubing. First twist the bared ends of the wires tightly together, wrap the splice with tape and then slip the tubing over the tape. This prevents the tape from unwinding and helps to exclude grease and dirt.



☞ Applied to the lamp in your instrument panel, finger-nail polish having a deep red color produces a pleasing red glow.



# Hydraulic Arbor Press Has Many Garage Uses



Garage mechanics and others who do not have an arbor press can improvise one from a hydraulic auto jack. The press has many uses besides arbor work. It can be used for forming sheet metal in dies, punching holes, straightening bent rods and similar work. It consists of four drill-rod posts, which are attached to a base and a header plate. A platform, which has bushings or sleeves welded in holes drilled near each corner, slides up or down on the

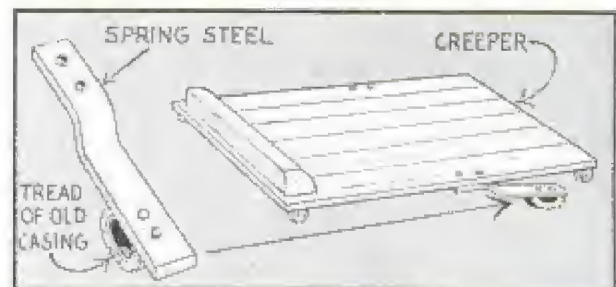
*Having many uses, this hydraulic arbor press is neither hard to build nor expensive*

legs, the bushings assuring squareness of the platform to the header plate. Both the plate and the platform are provided with tapped holes for conventional clamping of various setups.

—Peter F. Rossman, Kenmore, N. Y.

## Brake on Auto Mechanic's Creeper Keeps It from Shifting

The annoyance of having a creeper move, when exerting a pull on a wrench while working under a car, was avoided by one mechanic when he fitted a brake to the creeper. A length of spring steel about  $\frac{1}{8}$  in. thick and 1 in. wide was bent as indicated, and bolted to the underside of the creeper bed so that the other end pressed firmly against the floor. A piece of auto casing riveted to this end served as a brake shoe. When the workman wanted to move, he lifted the brake from the floor.



## Car Fires Quickly Extinguished with Bottle of Soda Water

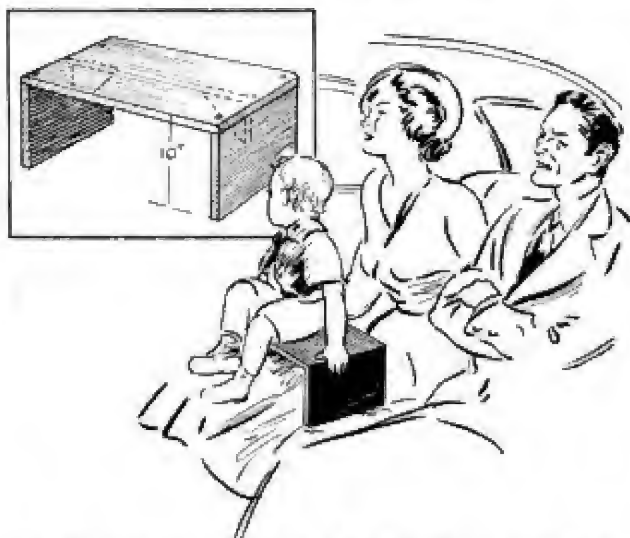
Fires may be extinguished with a bottle of soda water, which is no trouble to carry along in the car. Do not uncap the bottle but punch a small hole through the crown, holding a finger over the hole while shaking the bottle. Then apply spray to base of fire.—S. L. Freeman, Bennettsville, S. C.



*This brake keeps the creeper from shifting when you exert a pull on a wrench or on some part of the car*



## Seat for Baby Straddles Your Lap When Riding in Car



*This seat supports small child above your lap to avoid wrinkling clothes*

This seat solves the problem of holding a small child in a car. It's nothing more than three wood blocks nailed together as indicated. The sides should be wide enough to raise the seat an inch or so above your lap. If desired, the seat can be padded with oilcloth or imitation leather and cotton or upholsterer's hair. Or, you can just tie a small cushion on it.

## Drying Wet Ignition System

If ignition system becomes wet or damp enough so high-tension current tends to flow along the water film, or along wet cloth over cloth-covered cables, wipe off as much moisture as possible, then smear with heavy oil or grease. Oil breaks up the water film into tiny globules, greatly increasing electrical resistance. This is especially useful on boats where drying out with open flame may be dangerous.

## Check the Differential Carrier Before Riveting New Gear

A stripped differential ring gear is usually caused by one tooth breaking first and grinding off the rest of the teeth, and frequently when this happens, the force required to strip the teeth is sufficient to spring the differential carrier. The new gear, if riveted to this sprung carrier, will either be damaged or make a noisy job, due to the fact that a perfect adjustment

cannot be had when the clearance is not the same all the way around. The way to assure a satisfactory job is to cut the rivets that hold the old gear, and check the face of the carrier before installing the new gear. This is done by running the carrier on large centers, or by chucking accurately in a lathe. If the face of the carrier is more than .003 in. out of true, a light cut should be taken across to clean it up. When the job is assembled in the rear axle, the slight difference in the location of the assembly can be corrected with the bearing adjusting nuts.

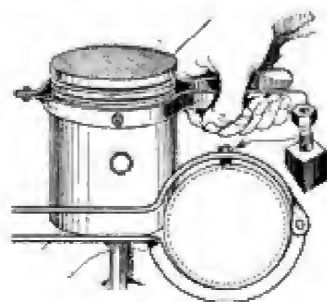
## Sealing Car against Dust Leaks

I noticed that after a few months of driving, the rear upholstery in my car, which has an all-steel body, was very dusty. To eliminate this, I removed the rear carpet and seat, and covered all the small holes in the floor with wide adhesive tape. I then taped the edges of the fabric cover of the large opening under the rear seat. This ended the "dust leaks," and the bad bumps do not fill the car with a cloud of dust as before.

—Don Hamill, Las Cruces, N. Mex.

## Piston-Ring Grooves Cleaned with This Scraper

Mechanics who have to clean a number of piston-ring grooves before installing new rings, will find this tool a timesaver. It clamps over the groove, after which it is rotated, a wedge-shaped piece cleaning out the groove. The tool consists of two lengths of flat iron, each piece being twisted at one end so that they can be pivoted together with a bolt. Small iron wedges or lugs of various widths should be provided for different sizes of ring grooves.



☞ A good method of polishing chromium-plating on your car is to rub it vigorously with a piece of soft leather cut from an old glove. This gives the surface a bright luster and does not harm the plated surface.







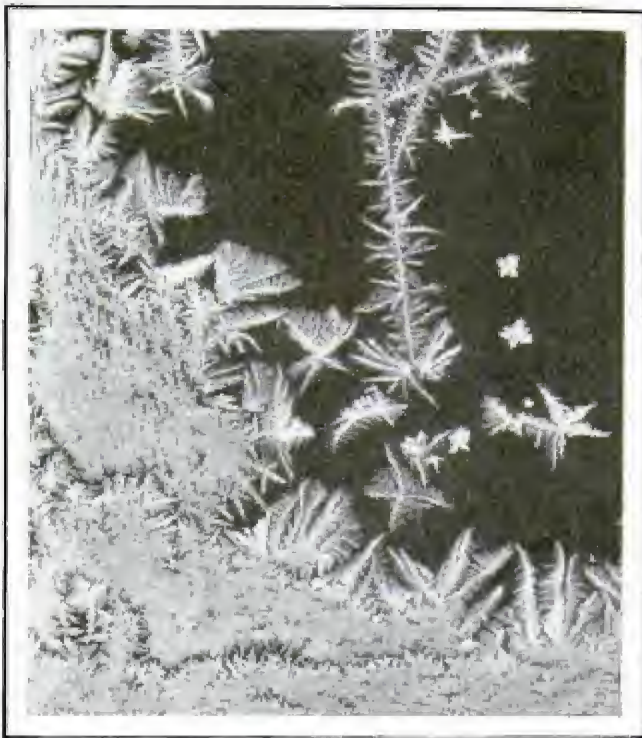
# 12923 "Click" Around the Clock

(Continued from page 725)

give the photo depth or a natural frame."

**Sunrise Pictures:** Try shooting these across a misty river. Just as the sun's disk begins to glow through the mist, try a very short time exposure—one or two seconds. Then, just as the sun breaks over the top of the mist, take a snapshot.

**Dawn Pictures:** Each morning, for a short while before the sun breaks over the horizon, scenes are lighted by a curious diffused glow from the sky, and sometimes



*Frost patterns on a windowpane make interesting picture studies. Snap them up before they melt!*

there are long low streaks of cloud. Pictures made at this hour have a strange, unearthly quality well worth seeking. The light is hard to judge, so when you find a likely scene, make several time exposures—ranging, say, from ten minutes down to ten seconds. Make a note of each exposure, compare the exposure times with the negatives, and you will have a fair guide for the next picture chance of this type.

**Street Scenes at Night:** With a box camera, try exposures of one, ten and thirty minutes on a typical scene—and examine the negatives to guide you next time. Snow on the ground acts as a reflector, making shorter exposures possible. If an automobile passes, hold your hand over the lens while its headlights are in view.

**Campfires at Night:** Time exposures of five to thirty seconds are usually satisfactory, depending on the brightness of the flames. Try these on your next sleighing or skating party, with your companions grouped about the fire.

**Night Snapshots at Home:** These are easy, because it is so simple to provide ample light. Just plug in two or three photo bulbs and direct the light on your subject. Inexpensive cardboard reflectors make these bulbs still more efficient. With two large bulbs in reflectors, four feet from the subject, you can take box-camera snapshots as easily as in broad daylight.

These are just a few of the hundreds of possibilities of "odd-hour" photography. The amateur who so wishes can get up before dawn, load his camera, and capture pictures right around the clock. He may begin by picturing frost patterns on the windowpane. New-fallen snow perhaps has molded the yard shrubs into strange new forms that make fascinating pictures in the eerie light of dawn. The first glimmer of sun across the snow may provide sparkle for a picture of the house in its snowy blanket.

By this time outdoor light conditions are becoming normal and the regular picture-day is in full swing.

In the afternoon, one may find the same amateur busy on the ski-run or skating-rink. As the light declines, he will catch a long shot of the rink, with skaters casting long shadows. Then one or more sunset snapshots. In the twilight, he may seek a campfire snap. In the evening, he may continue with snapshots at home—table-top pictures, "play" pictures of the children and pets. He may go out to picture the snowy streets—or, if he has a speedy miniature camera, to the theater, boxing match, basketball game, or even a stage show. Anywhere he goes, day or night, his camera can be with him—and busy.

These are new frontiers for the camera enthusiast. With modern cameras, film, and lights, his day stretches all the way around the clock.

☐ Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.



**"How about  
another helping  
of that good  
VELVET  
tobacco!"**



*Better smoking  
tobacco*

**Velvet**

- the **MILDNESS**  
of fine old  
Kentucky Burley  
aged in wood
- the **FLAVOR**  
of pure maple  
sugar for extra  
good taste

*Velvet packs easy in a pipe  
Rolls smooth in a cigarette  
Draws right in both*



## Chemistry and Your Car

(Continued from page 735)

decomposes rapidly when subjected continuously to high temperatures, its useful life is shortened by long exposure to sunlight and it has a tendency to crack when flexed rapidly and continuously. An automobile tire is brought into contact with the worst enemies of rubber—heat, oil, gasoline, sunshine and oxygen. This accounts for the short life of those early rubber compositions.

Today, chemists produce not only accelerators to speed up curing but other chemicals which, incorporated in rubber, slow down oxidation and make the rubber resistant to heat and flexing. Rubber tires contain carbon black to make them tougher. This also makes them harder and reduces their resistance to flexing, and the tread has a greater tendency to crack. So a flex-resisting anti-oxidant is added to make the stiff rubber stand flexing and that—in a tire—means long tread wear.

If it were not for anti-oxidants, the thin side walls of low-pressure tires which are constantly being flexed would soon crack, and bus and truck tires would soon melt or be ruined by the intense heat developed in them. All these improvements in tires—longer wear, greater mileage, lower cost, trouble-free service—have been brought about by using a few cents worth of chemicals per tire, plus a lot of research.

But even the best rubber today has its limitations for some parts of the car. No natural rubber will stand up long against gasoline, oil and grease. For years man tried to produce a synthetic rubber to overcome these limitations. And he failed. Then du Pont chemists attacked the problem from a different angle. Why, they asked themselves, try to imitate rubber? Why not make a product with the good qualities of rubber but without its poor ones? And that is what they did. They built a new material, chemically unlike rubber, from such things as limestone and coal and salt and water. The result has been "Neoprene," a synthetic material which performs virtually all the services of rubber—and also does many things rubber cannot do.

Today you find Neoprene being used in motor cars for such things as gaskets, oil seals, covers on ignition cables, in con-

necting hose and in other places where a material is needed which will resist oil, heat, ozone and corrosive liquids better than rubber. It carries the usefulness of rubber to new heights because it protects rubber parts themselves from their own weaknesses as evidenced by its use for the inner lining in gasoline hose at service stations.

More than four-fifths of the weight of a car is iron and steel. The average passenger car contains about a ton and one-half of iron parts but in early cars only two types of alloy steel were used. Today there are more than forty, each designed for a particular purpose. The chemist has helped produce each of these forty kinds of metal. Chemicals are required in pickling and cleaning metals in the foundry, in case-hardening iron and in all types of metal plating. Modern cars could not be built out of the metals available ten or fifteen years ago and the new alloys could never have been produced without the aid of industrial chemistry.

The engine of that 1918 car and the engine of a modern car are about the same size and weight. Yet today's engine delivers two or three times as much power. Many improvements contribute to this addition of power without increasing weight but one of importance has been the chemical treatment of oil and gasoline. When people demanded faster cars and more power a few years ago, engine designers were faced with alternate calamities.

They could increase the size of the power plant—which would leave no space for the passengers. Or they could increase the compression in the cylinders—which started the engine knocking. The idea was to get the added compression without the knock. Watching the flame of exploding gas in the engine, they discovered that when the knock occurred, the flame was yellowish or orange instead of blue. Iodine, they found, changed the color of the flame, but iodine cost a lot of money. Another chemical eliminated the knock—and also the spark plugs. A third had an odor—an odor like garlic. Finally they hit on tetraethyl lead. Today it is used in more than eighty per cent of all gasoline sold

(Continued to page 118A)



# FOR Thrills OF A LIFETIME

## A NEW 1939 HARLEY-DAVIDSON



### More Powerful, Easier Riding, Smarter Looking Than Ever!

**H**ERE'S first news of the great 1939 Harley-Davidson motorcycles—packing great thrills for the red-blooded, sports-loving, outdoor enthusiast. Improved motor performance — still lower upkeep—super-streamlined design—classy appearance — striking new color combinations — and many other outstanding features and refinements. A "mount" that opens up a whole new world of fun and excitement in that greatest of outdoor sports — motorcycling. Be one of the first to ride a new 1939 Harley-Davidson — have lots of good times — see the sights — make new friends — go on jaunts with other happy riders. Go in for gypsy tours — hillclimbs — reliability runs and other thrilling events that provide more real pleasure than you ever dreamed possible.

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Stamps enclosed to cover cost of mailing.

Name.....

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**Harley-Davidson**  
WORLD'S CHAMPION MOTORCYCLE



(Continued from page 116A)

and without it the modern high compression engine would be impossible.

The chemist has also developed anti-oxidants for gasoline to inhibit the formation of gums which result in clogging the motor and fuel lines. But that is not all. Chemistry has, in effect, doubled our oil reserves as far as gasoline is concerned, because, by the operation known as "cracking," the amount of gasoline obtained from a given crude is double that formerly obtained by straight distillation. Furthermore, cracked gasoline has a higher octane rating, that is, less tendency to "knock," but it is less stable than straight-run gas unless refined by methods which tend to destroy its high octane value. Here the chemist has stepped into the picture again with stabilizing agents which, without influencing the good anti-knock properties of cracked gasoline, prevent the formation of gums which clog the fuel lines.

More recently, the chemist has given automobile owners improved lubricants and also what are known as extreme pressure lubricant bases which, when added to an oil or grease, make it possible for bearings and gears to withstand much higher pressure without actually touching and possibly "seizing." Extreme pressure lubricant bases have made possible the use of silent-action hypoid gears because the peculiar frictional forces in such gears would quickly squeeze out the film of any ordi-

nary oil, leaving the metal surfaces in direct contact.

Nor do the contributions of chemistry to your car stop with oils and fuels. Safety glass consists of two layers of glass welded together sandwichlike by an interlayer of cellulose plastic—a product of the chemist. Chemical research has produced the molded plastics for steering wheels, gear shifts and door-handle knobs, ash trays, cigar lighters, window trim and dash panels. Man-made fabrics have been developed by the chemist for the automobile industry—such things as tire covers, curtains, upholstery for open cars and trucks, fender welting, trunk and deck materials, cushions and tool bags. These man-made fabrics have been designed to stand all kinds of weather and wear on the road—demands which leather and ordinary cloths could not meet.

The acid in your battery, the anti-freeze solution in your radiator, the polish and cleaner you use on the finish—chemistry has developed them all.

The automobile has been described as a chemical factory on wheels, a factory which takes gasoline, the raw product, and converts it into power to move the rear wheels. But the modern car is more than a chemical factory on wheels. It is an outstanding example of chemical magic, a product of chemical research from bumper to bumper.

## Three Seconds from Death

(Continued from page 677)

I let go and fell backward, expecting to be brought up by the wire. But the man above was out of step and I hit the stage floor with a jolt."

Letting a stunt man work out every detail of his "action" is an unwritten law in a studio, and failing to keep in time in such instances is unforgivable. Lyons once was called upon to drive north on a road paralleling a double-track railroad. He was to race a passenger train, also going north, and beat it to the crossing. Immediately after he crossed in front of this train, another train, traveling south, was to pass the north-bound train at the crossing.

Cliff and the director worked out the timing and rehearsed it with the trains. But an assistant director decided that if

the engineer from the south stepped his speed from twenty to thirty miles an hour, it would still give Lyons time to beat him and would make the race look better.

He probably thought Lyons would just step on the gas. But to get his timing right, the stunt man traveled by watch and speedometer—not by keeping his eyes on the train. So instead of beating the train, he tied it. He made the turn to cross the tracks when he saw the engine bearing down.

With a whirl of his wheel, he headed down the railroad—between the two tracks. But now he was driving toward the south-bound train, less than 300 feet away. To jump one way would put him

(Continued to page 120A)



# Enjoy the sense of security this "Power-House" can give you

## A NEW BATTERY

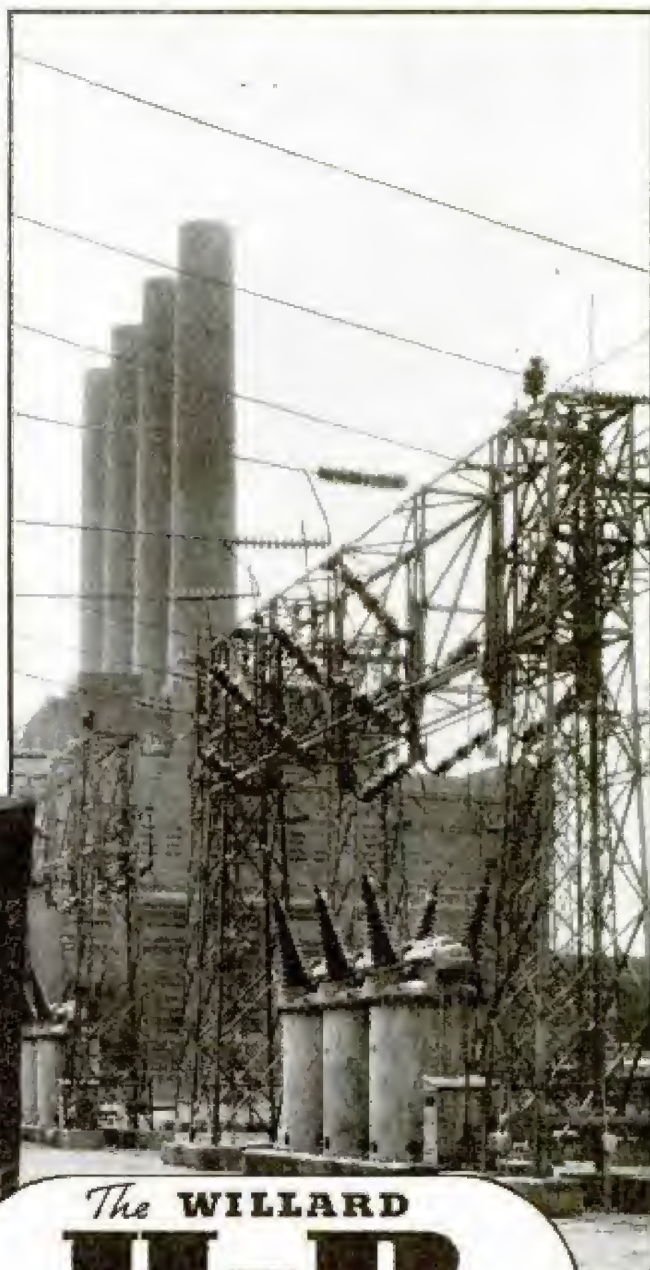
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This amazing performance is due to new developments, exclusive with Willard. Most important single feature is the new Willard Thread Rubber Insulator. Inserted between the plates of the "H-R", these Thread Rubber Insulators not only increase the battery's life—

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The WILLARD  
**H-R**

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(Continued from page 118A)

under the wheels of the train by his side. To jump the other would hurl him in the path of the approaching train. To stay in the car would be suicide.

"Grab a car window," Lyons yelled to a companion, who was doubling for a girl in the picture. "Get out of this!"

He held the bouncing automobile beside the train while his companion pulled himself out of danger. Then it was Cliff's turn. How he got from under that wheel, smashed a closed window of the railway car and jerked himself out of that trap, he doesn't know yet. But his feet left the seat of the automobile just as the trains met. There was a grinding crash—and the two trains rolled the light car between them.

That was perhaps the most spectacular stunt ever filmed, and would have been worth much to the studio—except for one



*Timing of the leap from the horse to the wagon is all important in this scene*

thing. When they saw the car between the trains and coming their way, director, assistant director and camera crew ran. The camera was smashed and not an inch of the film was salvaged. The whole thing was a total loss because of interference. Such interference, however, doesn't crop up once in a thousand stunts.

In the runaway scene in "In Old Chicago," where the father of the O'Learys is killed, Fox built a complicated device that pulled the pins to release the tongue from the wagon, and send the horses away, dragging Cliff after them. Ordinarily a tongue is released when wooden pins that hold it are broken by driving the wagon into a bump. Fox, however, devised a gun-like release in which a dynamite cartridge exploded and threw a lever which automatically pulled the pins.

"All I had to do," boasted Lyons, "was to touch a button and the whole thing was set off electrically. They even made a light steel sliding plate that fastened along my chest and stomach, so I could be dragged along the ground without injury."

"Unexpected quirks in the disposition of animals are the most dangerous elements in our calling," Ione Reed says. "Nobody ever knows exactly what an animal is going to do. And that goes for the meekest old saddle horse in Hollywood. The time a trained lion turned on me, ripped my leather coat, nipped me and then pulled me down with him, I faced no worse possibilities than when my gentle little pinto suddenly went cold-jawed and started to smash me against some big rocks. In the first case, the trainer reached us before the lion started chewing. In the other, when my pinto was headed, apparently crazy, straight for two enormous boulders, nothing but good luck saved me. Just as he reached the rocks he wheeled, whirling me from the saddle. Somehow, I was able to ward myself off the rock and bounce back in the saddle again.

"But if you want a really interesting story, ask Cliff about the haircut he got when he bulldogged the steer."

"Oh, that," Cliff grinned. "Because it was done on a stage, the steer was pretty wild and we didn't have much room to prance about. So when I threw him, I found myself on the ground in front of him, with the side of the arena about four inches behind me. He was down, but I didn't have room to twist him off his knees. Also I didn't have room to jump back.

"I called to the men on the stage to take him when I let go. But when I released his horns he began hooking. So I flattened out, trying to burrow into the dirt on the floor. Then I saw the steer twist down and whisk a piece of paper off the floor. He could certainly use those horns.

"I flattened closer to the floor and closed my eyes as I saw his head twist again. I felt a little sting on my ear and something brush my hair. How long I lay there, with him over me, I don't know. But finally they got him away. A bit of skin was taken off my ear and a rough path was cut through my hair above the ear. The hair wasn't pulled out, it was cut—ragged and uneven, but cut."



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manufactured to the high Edgeworth standard — better tobacco, made to smoke cooler, means *no tongue bite* and permits you to enjoy fully its enhanced flavor, greater mildness and richer aroma.

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## "Life Guards with Wings"

(Continued from page 683)

message blocks which are dropped to vessels not radio equipped and thus cannot be warned in the routine manner.

Even bird counting comes within the province of the Coast Guard airplanes.



*Mess hall for enlisted men at Coast Guard station. Officers have own mess room*

Some time ago, planes were sent up along the coast on a survey of wild-fowl life.

When not engaged in actual flying, the airbase maintains a constant hum of ac-



*Survivor of wrecked schooner on way to shore in breeches buoy rigged by Coast Guard*

tivity. Rescue drills, gunnery, first aid and fire-fighting training are some of the things interspersed with the normal routine duties incident to operation of such a large station.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.



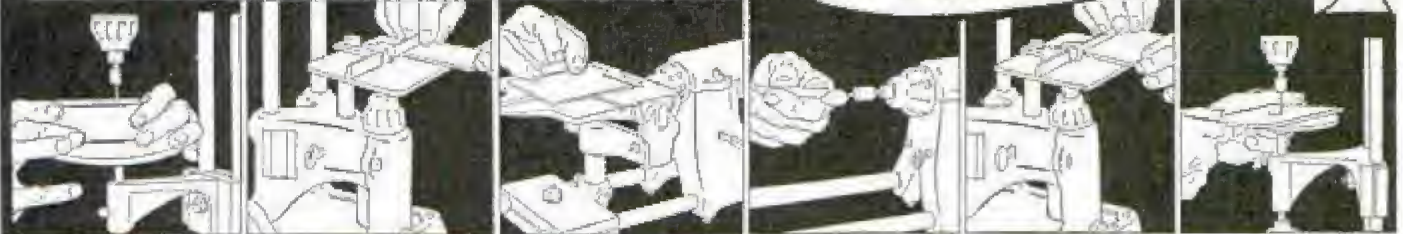
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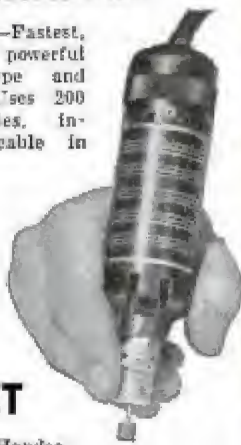
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# The Secrets of Speed

(Continued from page 709)

There are also projects to re-design stock automobile racing engines into lighter and more powerful motors of about 488 cubic inches and turning up to 6,000 revolutions per minute. There has been talk, too, of a tremendous power plant to consist of two 1,500-horsepower, twin-row radials, one mounted behind the other, with the rear unit geared through the front unit to turn two blades of a double propeller. In this case the large frontal area of the radial ought to be more than compensated for by the power the combination would develop.

Eventually, years from now, someone is going to set a speed record that no one can ever beat with the present type of airplane. Man has always flown at about half the velocity of the average revolver bullet and has his eyes set on an ultimate speed of close to 750 miles per hour, the speed of sound. He will never attain that in a winged propeller-driven airplane, of course, for the limiting factor is really the velocity of the air moving around the plane, and the velocity of air over the top of the wing is always greater than the forward speed of the plane. There is a great falling off in efficiency of airfoil shapes above 500 miles per hour, as has been learned by turning propeller blades at such speeds.

Designing a race plane is primarily a matter of building the plane around the best engine available. One way to get speed is to make the wing as thin as possible but structural considerations prevent this from being carried to an extreme. In any event the wing tips are thinned down considerably because there is less need for great strength at the ends.

Another way to get additional speed is to cut down on the size of the wing although this makes the plane sloppy on the turns. A wing loading of twenty-five pounds per square foot is about right for planes competing in closed-course races. Heavier wing loading will make the plane faster in straightaway flight but it will mush badly and lose speed on the turns. Sometimes during an air race you will see one fast plane catch up with a competitor on each straight leg and then drop back as the other plane makes a tighter and faster turn.

One of the biggest problems in designing a fast plane is to find room inside for all the gear and tanks that must be carried. The fuselage is barely wide enough to accommodate the pilot and is just high enough to allow the pilot to hide behind the engine and still see out. One reason why a low wing is favored for race planes is that it offers a convenient place for retracting the wheels.

In the old days when biplanes were raced it was customary to "tune" a ship by adjusting its rigging before each race but now a plane has to be tuned before it is built. Getting the proper balance is a delicate and extremely important job. Variable loads such as the fuel supply are placed close to the center of gravity. The oil tank is a handy weight because it can be placed nearly anywhere inside the fuselage to help stabilize the balance. Only a small amount of oil is used during a race.

The whole idea in balancing is to get the plane to fly a straight level course with the hands off the controls. That is difficult and the average race plane "hunts" up and down, forcing the pilot to make slight corrections with the controls. That cuts down top speed because the drag is increased when a control surface is moved into the wind.

In the same way that automobile racing has been a proving ground for the motor-car industry, airplane racing has contributed many things to make modern planes safer and more efficient. Retractable landing gear and landing flaps are good examples. Investigation of aileron flutter resulted partly from the troubles racing pilots were having. Much of the streamlining of today's airplanes can be traced directly to the race course. The cantilever low-wing monoplane shape and the use of wing fillets were partly developed by racing. Motor troubles peculiar to aviation, such as cooling problems, have also been whipped in part because of the resourcefulness of the fast-flying pilots.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.



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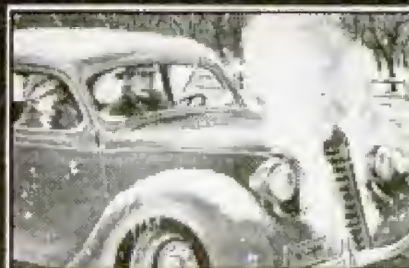
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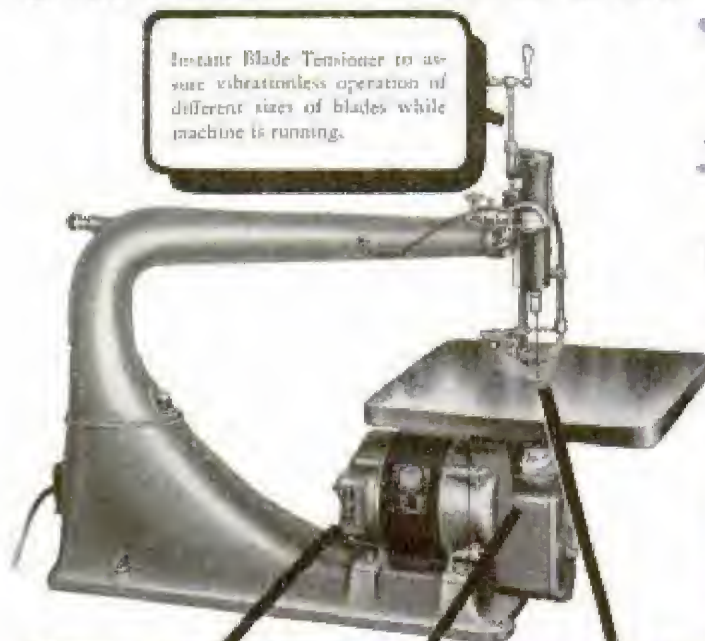


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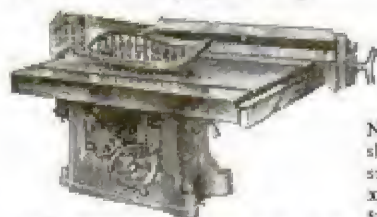


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Here's relief for the head of the house when he tries to carve a slippery roast or fowl without sloshing it from platter to tablecloth. Stainless steel pins, sold in sets of four, are offered as the solution. The meat is impaled on the upturned pins and rubber suction cups anchor them firmly to the platter.

## Plane Engine Cooled by Water Held Under Pressure

Using water under pressure to raise its boiling point, a new British airplane engine is fitted with a novel cooling system. Liquid-cooled engines generally use either a high-boiling liquid, such as ethylene glycol or plain water. The latter boils at too low a temperature and the former has corrosive effects on joints in the cooling system, besides necessitating the carrying of extra supplies. The new system overcomes both disadvantages, it is claimed. American airplanes have leaned toward air cooling in recent years, but a shift toward liquid cooling is expected.

Whitworth-Whitley  
Lambert's Plane



14888

## Power Applicator Coats Pipe With Cement as It Moves



Pipe-coating machine traveling along the line, applying cement material

For protection of new or old piping, a machine invented recently coats the pipe with cement or plastic material. Powered by a gasoline engine, the machine moves along the piping as the coating is applied. It can be used to apply coating while the pipe is on the ground or in a ditch.

## Vacuum Cleaner for Typewriter Also Serves as Blower

Designed to blow away the dirt or inhale it, a double-acting vacuum cleaner for office appliances has a long nozzle to reach into inaccessible places in typewriters, addressographs, dictating and adding machines, and it is quickly adjusted to act as a blower or a suction cleaner. The vacuum head is specially designed to remove wax particles from dictating machines.



Cleaning the typewriter by device that sucks or blows away the dust

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burn TONIGHT!



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REMEMBER EVERYTHING  
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**NICHOLSON FILES**  
A FILE FOR EVERY PURPOSE

## Ether Jumpers Never Sleep

(Continued from Coloroto Section)

in 1,200 years. The complete program was to last only fifteen minutes and yet we sent this expedition to the only point in the 5,000-mile path of the eclipse from which satisfactory observations could be made, knowing in advance that if the day should prove cloudy there might be nothing to put on the air."

In recent months there have been significant developments in ether jumping which students of world affairs as well as radio engineers and scientists believe soon may prove important in influencing the course of history. One was the formation of the International Broadcasting Union for the exchange of foreign programs throughout the world. All the great broadcasting systems of the globe were fused into a single universal network at the start for a program from Buenos Aires by the Asociacion de Broadcasters Argentinos.

"There is every indication that music programs such as this will become exceedingly popular with the ether jumpers, for music is a universal language, which needs no translating." Mr. Royal explained. "It may well mark the beginning of a new era in which the radio engineer, the scientist and the musician have combined to promote international understanding of the various national cultures. To this end the principal broadcasting companies of each nation combine to present a program of music typical of their land, with radio systems of other nations throughout the world relaying the program to their respective peoples."

Another significant development is that of the powerful mobile station which attracted the attention of the ether jumpers in March, 1937, when radio listeners on the short-wave band at 4 p.m. were amazed to hear an anonymous foreign station come in as strongly as the most powerful local station.

"Here speaks an illegal broadcasting station in Germany of the German Communist Party" the announcer told the ether jumpers in English. "We will broadcast again tomorrow night punctually at ten despite the German Secret Police and if this station should be traced and ourselves captured, all arrangements have been made



for a broadcast to be made from another station."

Despite efforts of German radio engineers to discover the source of this powerful station by means of directional finders, a method which generally can trace a transmitting radio station, they failed in this instance. As a result they concluded the programs were being broadcast from a fast-moving truck equipped with a powerful transmitter and telescoping antenna. The only way to interrupt its activities was to "jam" the air with a program sent out on the same wave length. This illustrates dramatically how the ether jumper today may get messages from distant points in spite of many obstacles.

During the same week another example of this sort surprised the ether jumpers when, as the Spanish rebel army was hammering at the very gates of Madrid and their planes were dropping bombs on the besieged city, the loyalist station broadcast a message to America on a wave length of 9.4 megacycles, also coming in strongly.

"This is EAQ, No. 2" the announcer said. "Hello, hello, English-speaking friends and listeners everywhere. Take a walk with us along the deserted streets of Madrid. Hear the dreadful hum of an approaching enemy plane. Listen. The bomb is exploding."

So the eye-witness description of an actual air raid was broadcast and ether jumpers heard the bomb actually explode. This was made possible not only by the most modern broadcasting apparatus but also by a new directional microphone which picks up sounds in a certain direction and excludes them from others, American radio engineers pointed out.

All of these important happenings in international broadcasting have proved that while ether jumping is still in its infancy, and one of the newest of sciences, it is making tremendous strides forward. "It is already a factor in world affairs today," Mr. Royal points out, "and tomorrow its far reaching effects may be well nigh incalculable."

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## Keeping Zoo Animals Happy

(Continued from page 703)

ers consume 600 pounds of meat and 400 pounds of fish every day. One hundred and seventy tons of hay and 100 tons of alfalfa per year supplement the grains fed to some of the others. Ninety pounds of stale bread are on the daily bill of fare and every available kind of vegetable and fruit, strictly fresh, is also served. Red meat is not enough to keep lions and tigers in condition and they are supplied with liver, kidney, and similar meat as well. Chickens and rabbits and other small animals that are killed for feeding snakes and owls are fed whole since fur, bones, and feathers are an important part of the natural diet of these animals. Once a week the tigers and other "cats" are fasted for twenty-four hours in imitation of the occa-



*Polar bear grotto, with one bear enjoying a swim in the large pool*

sional fast that they experience in the wilds when hunting is poor.

Even the way animals are fed is as important as providing the right food. Some monkeys won't eat fruit unless they can peel it themselves while other monkeys have to have their fruit cut open for them. Lions and tigers want their meat in great chunks and a dark private place to which they can retire to gnaw at their food. Some birds like to scratch for their food, others want it on the trunks of trees, while still others sulk and starve themselves unless they can obtain their meals on the high swinging top branches of trees.

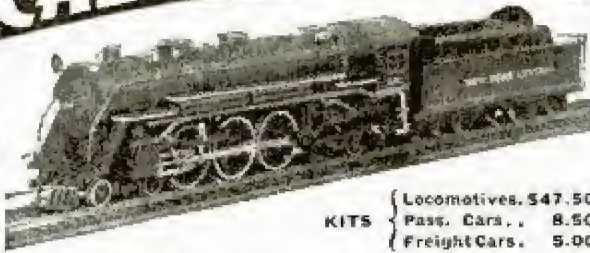
Another part of the job of keeping animals happy is to provide them with something to do. All of the monkeys except the gorillas are mechanically minded and like

(Continued to page 132A)



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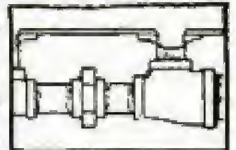
SMOOTH-ON No. 1 judiciously applied at cracks, leaky seams, pipe threads and flanges, seals steam, water, gas, oil, or smoke leaks quickly and permanently.

Householders find hundreds of uses, such as making stripped screw bolt and nut threads hold, tightening loose hooks, locks, hinges, bath room fixtures, handles, casters, mending leaky pots, pans, stove ovens, etc. Excellent for stopping leaks in auto radiators, cracked water jackets, leaky seams in gas tanks, tightening loose hub caps, exhaust pipe and heater connections, lamp and tire braces, etc. A Smooth-On repair holds on any metal and is proof against pressure, heat and vibration.

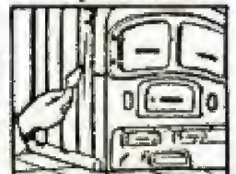
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II-35.....



(Continued from page 130A)



## ... when you get a Barbasol Face

You've probably read hundreds of shaving cream ads, and most of them written by experts, but here's one that's just plain talk.

The truth is, you can shave the whiskers off with any good cream, but you want more than that. You want a better shave . . . a smoother, softer skin . . . a Barbasol Face.

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to have balls, old tires, chains, and bells that they can take apart or play with. The gorillas prefer ropes swinging from the top of the cage that take the place of strong vines, and stumps and logs that can be rolled around. Gibbons and spider monkeys, used to traveling on the tops of trees, are provided with mazes of high trapezes so that they can swing along in any direction inside their large cages. Bears like caves for sleeping and hibernation and the wart hog likes a small cave that he can back into.

All clawed animals like to have tree trunks on which they can sharpen their claws and most birds prefer trunks with the bark still on. The cat animals, too, and the bears like natural trees or imitation concrete trees with many branches on which to climb. The goat tribes appreciate high towers and precipices. Tall towers with steep runways and with jutting corners and ledges have been built for the goats and mountain sheep at the zoo and one of the wild mountain goats always bears its young at the top of one of the towers. The baby is able to make its way down to the ground a few hours after it is born, a feat that would be difficult for most humans.

Practically all birds and animals enjoy the rain and the keepers have learned not to shut them up when showers begin. Many of the animals also like a daily swim in a pool. Even the gorillas and tigers want an occasional bath, and pools are also provided for the bears, elephants, tapirs, swine and for some of the reptiles that like to play in the water. Fresh running water is provided in every cage and enclosure for drinking purposes. The raccoons have to have a special small pool because they like to wash every piece of food before they eat it. The gorillas wash some of their food, such as bananas and apples, but don't wash carrots, celery, or oranges. The distinction seems to be that the primates wash only the foods having rinds that they expect to eat.

The trend in zoo architecture is to eliminate barred cages in many cases so that the wild animals can be watched more naturally by the spectators. Monkeys and apes, of course, must still be kept in cages because they are great climbers, but at San Diego you can peer directly into bear



dens, and watch lions and tigers sun themselves only a few feet away, and yet remain in perfect safety. These grottoes for the bears and lions are walled on three sides and the walls arch inwardly so that the animals can't escape. The front of each grotto is protected by a long narrow pit and in some cases a moat that is hardly apparent to the spectators and yet is wide enough to prevent the animals from leaping across.

One of the attractions of the zoo is the biggest bird cage in the world, a screened enclosure so vast that it contains trees more than 100 feet tall. The cage is 122 feet high, 210 feet long and sixty feet wide, large enough to permit long flights by the eagles and other birds it contains. This cage has enabled the zoo for the first time in history to raise man-of-war birds in captivity, since these pirates of the tropics are happy only when they can steal their food from the beaks of other birds while they are flying in the air.

Healthy animals don't need hospitalization but when claws have to be cut, wounds dressed, or a broken limb placed in splints the animal is moved to the zoo's modern animal hospital for treatment. Every kind of disorder can be treated as well as repairs made to mechanical injuries. The hospital equipment includes X-ray facilities, operating tables, provisions for administering anaesthetics, and compression cages in which animals may be held while the sides are squeezed together to hold them motionless while wounds are being treated.

Animals and birds normally have their babies in the spring. This leads to complications when new animals from the southern hemisphere arrive. The seasons are opposite to ours south of the equator and spring down there occurs when we are having our autumn. True to the calendar, animals fresh from the south have their babies during the fall months for the first year or so, at the time when it is spring in South America, Africa, and Australia. After that they learn to adjust themselves to the new seasons and raise their families at the proper times.

❑Inquiries as to makers of articles described in Popular Mechanics will be answered by our Bureau of Information upon receipt of return postage.

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## Lightning-Dodgers of the Forest

(Continued from page 693)

the telephone is dangerous and for listening on a regular schedule to the pack sets carried by individual rangers and to the portable sets installed on service cars and fire-tank trucks. By means of the pack and portable sets rangers in the field can make their way direct to a fire that is still too small for them to see, by communicating directly with a lookout tower that has a better view. Radio is useful in many



Ranger plotting location of forest fire by measuring angle on photo-map

other kinds of forest emergencies and a ranger can even summon aid if he happens to run out of gasoline on a forest-service road miles away in the timber.

Getting the jump on forest fires by deciding just when and where the next one will break out and sending a crew to the spot ahead of time is one of the latest tricks of the Forest Service. On every hot dry morning the fire dispatcher makes a careful survey of conditions in his forest and then he is apt to issue a string of mobilization orders. In the Angeles national forest, Fire Dispatcher V. C. De Lapp can summon 1,000 men and several dozen pieces of equipment by phone, radio, and



14982  
messenger within a few minutes in this manner:

"Camp three? Pull every man out of the eastern area. We don't expect any fires there today. But I want you to have two First Suppression trucks and twenty men on Barley Flats by one o'clock. Fire will probably break out before three if we don't watch it. And put patrols out in Sawpit Canyon and the Little Santa Anita. Ask the C.C.C. boys to stand by for orders. We may have three or four fires on our hands by dark."

How can they tell ahead of time where the next fire will break out? One of the reasons is a new gadget called the fire stick that almost seems endowed with supernatural powers.

The fire stick is nothing but three short pieces of ordinary pine wood held parallel by small wooden dowels. When a forest ranger consults this natural oracle he is told a great deal about the fire possibilities for the next few hours. No one must ever touch the fire stick and one end of it must always point toward the north. That sounds like voodoo magic but there is a sound basis for the fire stick.

The value of the stick is that its moisture condition approximates quite closely the moisture condition of the natural forest "fuel." The chances of a fire starting and its rate of speed depend in part upon the moisture content of the forest cover. The fire stick is used as a standard for measuring this condition.

"Each fire stick weighs exactly 100 grams when bone dry," De Lapp explains. "Placed out in the open air, the stick absorbs some moisture from the atmosphere and we weigh the stick three times a day on a sensitive balance to find out its percentage of moisture content. If the moisture content happens to be high some morning we know that the trees and brush in the area are so saturated that a fire could hardly start.

"On the other hand, if the moisture content happens to be only three or four per cent we know that the natural forest cover is likewise virtually bone dry and that if a fire starts it will spread almost like an explosion. The fire stick is always pointed toward the north on its cradle so that it will receive standard radiation from the sun. It is never handled directly but is

(Continued to page 136A)

## SHORT CUTS FOR THE CRAFTSMAN... NO. 1

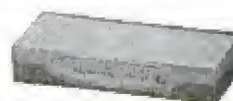


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It's easy to put a fine, keen-cutting edge on engraving tools with a Carborundum Brand Silicon Carbide Combination Stone. Use the coarse side to sharpen, then hone on the fine side to bring the tool to a sharp, satiny edge.

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ABRASIVE

PRODUCTS





H902

(Continued from page 135A)



# Wood Workers

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**Deal No. 101 only \$1.98.** High quality scroll saw, one dozen saws, choice of mahogany or walnut, for two corner pieces, 2 blue prints, all needed hardware. Total \$1.98.

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**PAGE** after page of beautiful, rare imported woods from all corners of the world at attractive low prices. Full instructions for all types of wood finishing and finishing secrets.

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Also large assortments of attractively designed legs, carved decorations, mouldings, plain and ornamental hardware of all descriptions.

Also list of all materials to make Venetian blinds for your home or for profit in selling to others—hardware, tape, slats, cords.

**72 Blue Prints of Scroll Patterns** every scroll saw user should have.

The catalog explains the new Craftsman Art Inlay Process. So easily learned. Yes, everybody can now make beautiful inlaid trays, plaques, etc., without tools or clamps.

This is but a partial list of contents of the new Craftsman's Catalog No. 10, and all this for only 10c. Send coupon below for your copy while edition lasts. Better write at once!

picked up with tissue paper because oil from the hands might affect its weight.

"Relative humidity of the air is another way of determining the inflammability of forest cover, but atmospheric humidity may suddenly jump up and a corresponding rise in the moisture content of the fuel may be delayed from half an hour to three or four hours, hence the humidity isn't very reliable. The fire stick never lies."

Predicting forest fires has been made an intricate but pretty accurate science by co-relating fire-stick readings, wind velocities and directions, the number of people known to be in different parts of the forest, and the color of lightning flashes. Ten thousand lightning flashes were studied over a twenty-year period with the result that the fire fighters know that bluish white lightning is almost certain to start a fire while white, yellow, and red lightning follow in lesser degrees of hazard. The color of the strike seems to be related to the amount of accompanying rain, if any, and since bluish white lightning is usually "dry" it contains the greatest hazard.

Forest fires don't happen unless the forest is dry and a source of fire is present. Experienced men can judge just about how many fires lightning will start in a given area, based on the kind of storm that is rolling in. If two fires are expected in one district and if the storm covers three districts the rangers can be reasonably sure that they will have six fires on their hands. Statistics on the number of fires that start along highways and canyon bottoms as compared to the number of people vacationing in a forest on a given day tell the rangers quite closely how many fires are apt to be caused by humans, and from the same statistics they can judge just which areas are the "hot spots." That gives them a head start in getting to the dangerous areas ahead of time and issuing special warnings and they have the advantage of being on the spot prepared for a hard fight if a fire does happen to break out.

Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.

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I enclose full amount ☐ or enclose \$1, balance C. O. D. ☐

Money back if not 100 per cent satisfied.



## Don't Pity the Poor Eskimo

(Continued from page 662)

and carried in a lady's purse. The Eskimos have had them for centuries. Their rain parkas are hooded, too; they are translucent and they can be folded into a small package. They are made from strips of walrus intestine sewed together.

In developing the oomiak, these Eskimos faced the problem of designing a boat for hunting walrus and whales in the stormy waters of Bering Strait with its crushing ice floes and treacherous currents. Since whales often weigh as much as fifty tons, and walrus from 2,000 to 3,000 pounds each, they must be hunted by large crews. The boat must be capable of transporting eight to ten men, surviving heavy weather and bringing home the catch. To solve this problem, the Eskimo had only driftwood and hides.

The oomiak is dory-shaped for seaworthiness, and from twenty-five to forty feet long. The frame is of light driftwood spruce, each piece carved to shape and the pieces lashed together with rawhide thongs. Strength is obtained by several single-piece longitudinal members lashed to the ribs. Sturdy stem and stern pieces are carved from driftwood stumps, making use of the natural curve of the stump and roots. These are dovetailed to the keel.

Over the frame a covering of wet, split walrus hide is lashed, with wet rawhide lacings. Three or four of these hides are sewn together with sinew in invisible stitches to form waterproof seams. As the skins and lacings dry they contract, stretching the covering to drumhead tightness.

The flexible construction of the oomiak makes it extremely resilient so that it can absorb shocks that would crush most boats. Each oomiak is equipped with oars, paddles, mast, and sail, and usually an outboard motor. The oars are used for long pulls, should the motor fail; the paddles for fast work amid ice floes; the sail to take advantage of favorable winds. Caught far out at sea, with a whale in tow, the crew may utilize motor, sail and oars simultaneously. We found no record of any oomiak crew at Cape Prince of Wales having been lost at sea. Surely this is a tribute to the oomiak as well as to the skill of

(Continued to page 139A)



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Disston DeLuxe . . . a home workshop circular saw you'll be proud to own. You thrill to the performance of a fine car. The same sort of satisfaction is yours when you work with a Disston DeLuxe.

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Disston Steel, Disston workmanship, smooth finish, accurate fitting, sharp teeth that hold their cutting edge . . . truly, this is the best circular saw ever made for your home workshop. Ask for it by name—"Disston DeLuxe"—at your dealer's.

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7" (1/2" hole) \$3.10	10" (5/8", 3/4" hole) . . . \$4.50

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6" (1/2" hole) \$4.30	8" (1/2", 5/8", 3/4" hole) \$5.40
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Two sturdy Moto-Tools serve every purpose of craftsmen. The No. 1 machine, weighs 6 oz., 25,000 r.p.m., is recommended for light bench work. Model 2, weighs 13 oz., about 27,000 r.p.m., a rugged machine "packing plenty of power" with extra mechanical refinements that shop men want and appreciate. A Universal Stand and Shaping Table are available for difficult precision work. Leading dealers carry Moto-Tool; order by mail on 10 day money-back trial. Send for free, colorful, Moto-Tool Booklet.

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50 H. P. with KRW V8 Unit using natural gas (1125 BTU) @ 30c per 1000 cu. ft. . . . . \$ 46.80 per month

50 H. P. with KRW V8 Unit using gasoline @ 10c per gal. (no tax) . . . . . \$140.40 per month

Above figures show primary fuel costs (lubricating oil not included) for operating a KRW V8 Unit to develop 50 H. P. for 10 hours per day—26 days per month. Compare this with electricity @ 3¢ per KWH which amounts to \$340.60 per month. You can pay for a KRW Unit in a few short weeks out of actual savings!

KRW V8 Units are daily saving money for operators of air conditioning and refrigeration equipment, mills, factories, shops, welders, compressors, pumps, well-drilling outfits, contractors' equipment, etc. New KRW "GUARDIAN" automatically stops engine in case of cooling or lubrication failure.

Write for new bulletin just off the press—packed with useful information, engineering data, etc. You can buy through your local Ford Dealer and benefit by local service and low-cost Ford engine replacement feature.

**K. R. WILSON 17 Lock St. BUFFALO, N.Y.**  
Builders of Shop Equipment for Ford Dealers Since 1916  
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**Gas-Powered MODEL \$3.95 plus 20c postage**

**AIRPLANE MODEL KITS** . . . world's champion Bassett's new 48-in. gas-powered crackup-proof Sensation. Finish prop., many ready-made parts, rubber wheels, \$3.95 plus 20c postage. Also new—Giant Fillers with motor-hum device, \$1.00 up.

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Made of high grade tan elk leather with double oil tanned moccasin sole, rubber heel and Talon Fastener. Used for many purposes around camp and cottage. Colors, brown and black. Sizes 3 to 12. Widths D, EE.

Write for Fall Catalog

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**\$2.90**  
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How often have you found yourself on the wrong road? You know how annoying it is to retrace your way when you are in a hurry. The Hull Auto Compass always shows the direction of travel, saving you miles, money, worries and delays. Only \$2.95 at your dealer. Two-piece model \$1.95. Write for circular.

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Make your own at low wholesale cost. It's easy under our unique plan. All materials supplied. Send 20c for circular and samples of Ladder Tape, Cord, Rails, Slats, 15 color samples of tape and chart listing most decorative color combinations.

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**NEED MONEY?** Men or Women

Part time or full time to sell

**Beautiful LEATHER TIES**

In fancy embossed patterns and handsome colors. Can't be told from silk. A clever novelty, long-wearing, won't wrinkle. Cleaned with a damp cloth. Sell on sight. Everybody wants them. No sales ability needed. Send 50c for samples and information on how to get started.

**CENTURY TIE CO., 2345-L, W. Grand Blvd., Detroit, Mich.**

When writing please mention Popular Mechanics



(Continued from page 137A) *H 906*

the men who designed it centuries ago and the men who build and sail it today. The U. S. Coast Guard cutters patrolling Bering Sea waters usually carry an oomiak to reach places where no other boat could venture with safety.

Although the Eskimo has adopted the rifle, he still finds his stone-age harpoon indispensable. For instance, a walrus, shot dead in the water, sinks instantly, and is lost to the hunter. But if the hunter can get a harpoon into the animal, he has it hooked like a fish. The Eskimo harpoon is essentially a sharp-bladed projectile attached to a rawhide line that can be forced into the animal's body. Once it has penetrated the tough hide, the harpoon head comes loose from the shaft and turns with a toggle-pin action, anchoring the head and the line firmly within the carcass. The head is attached to the line by a slipknot that can be released to free the line without removing the harpoon head. The long heavy shaft serves as a handle for the projectile and as a means of propelling it. As soon as the harpoon head is driven home, the handle comes loose and floats on the water. A running ring, sliding along the harpoon line, prevents the handle from drifting away.

The entire harpoon assembly, except for the steel blade of the head, is made from native materials; the head from walrus-tusk ivory, the socket from bone, the shaft from driftwood, the lashings from whale baleen and the line from seal rawhide. In fashioning the harpoon, the Eskimo shows expert workmanship and a thorough understanding of ballistics. Again, he displays his ability to analyze a technical problem and find the right answer.

Away back in the dim past, he found the right answer to the problem of daily diet: eat all the digestible parts of the animals one kills. Livers, brains and hearts, for instance, contain elements which the human body needs. Most of us get too little of these elements. But the Eskimo's diet is rich in them. Also, the Eskimo consumes a lot of seal oil. And seal oil is closely akin to cod-liver oil. It took years of propaganda to convince the so-called civilized peoples that cod-liver oil was good for them. The Eskimo knew it long ago.

He didn't know about the airplane until

(Continued to page 141A)

## FREE NEW KIND of INFORMATION BOOK:



### Tells how, where to get expert advice on TOOLS, FREE PLANS, FINISHES, GLUING

It answers such questions as:

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The new sensation in men's shoes — The Chippewa Clipper. It zips on and off in a "jiffy". Right now is the right time to get into a dignified and highly profitable shoe business of your own with this fast seller, and a complete line of almost 250 styles of dress, work and sports shoes. Prices as low as \$1.98 a pair. Free 10-second demonstrator sells super-comfort air-cushion shoes like magic.

Manufacturer established 35 years wants salesmen. No experience needed. Write for complete sales kit. It's free!

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## CONTINENTAL BAND FILER

A new, efficient bench model for rapid internal and external filing. 32" high. Weighs 150 pounds. Only \$88.00 without motor.

See at your Dealer's or order on 10 days' trial. Circular Free.

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Get in quick. Install self attaching electric outlets in a second. Fits anywhere: baseboards, walls, glass, etc. No screws, nails or tools. Snap on and collect. Each outfit adds 2 standard wall sockets to room, buildings, schools, homes, stores, all prospects. Carry in your pocket. Cost amazingly low. Best of all it is BRAND NEW. Big discount in AGENTS. Should sell like wildfire. Andy sold 7 dozen one day. Be the first in your locality to handle this QUICK PROFIT item. Write or wire for terms.

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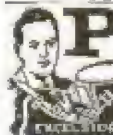
NATIONALLY ADVERTISED 8M31 and 1631a movie cameras. Reprints. For home, business, church, school, club. MONEY BACK TO DAY TRIAL. Payments as low as 10¢ A DAY. Satisfied customers throughout the world. FREE demo. WHITE TODAY. Ben Eider's Home Movies, Dept. A-11, 739 Baylston St., Boston, Mass.



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New!—Sells Like Wild

Clears off Frost, Mist, Sleet, Snow, the NEW WAY, Self-feeding. Uses no heat — no electricity. Absolutely no wires — no tubes; no installation. Saves battery. Fits auto pocket. Gives all around vision. Defrosts BOTH sides of glass. Works instantaneously. Kinds dangerous blind driving. Low priced. Autoists will about it. AGENTS WANTED EVERYWHERE. Hustlers cleaning up big money.

SAMPLE OFFER Samples sent on trial to first person in each locality who writes. No obligation. Get details. Do first—send in your name TODAY.

THE KRISTEE PRODUCTS CO. 681 8th St. Akron, Ohio

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(Continued from page 139A)

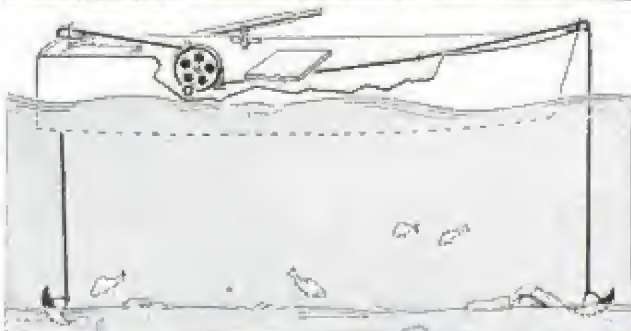
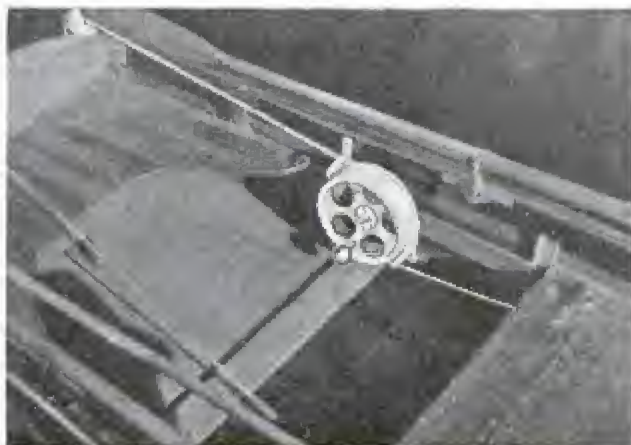
recently. But he was quick to see its advantages. Every spring, Eskimo men from the Diomed Islands in Bering Straits, have gone to Teller and Nome to work on the docks and at placer mines. Until the airplane came, they had to wait until the ice broke up and make the trip by oomiak. Last spring they chartered a plane and flew to work, making the trip in hours instead of days and gaining an extra month or six weeks of employment.

So don't pity the poor Eskimo! Living among them, we admired their wisdom in clinging to the ways of their ancestors when those ways are best. We admired their readiness to adopt white man's ways of proved value. We marveled at their ability to live happily in an environment in which few white men can survive—unless they adopt some of the stone-age ways of the not-so-dumb Eskimo.

(To be continued)

## Anchor Rope Reel for Rowboat Controlled from Center Seat

With an anchor rope reel installed in his small boat, a fisherman can drop anchor at bow and stern without moving from the oarsman's seat. The reel, too, keeps the anchor ropes neatly wound, and a wing nut locks the anchor at any required depth.



**STOP! DON'T  
PUT IN ANTI-FREEZE  
TILL YOU CLEAN  
OUT THAT RADIATOR  
WITH SANI-FLUSH!**



Never put anti-freeze in a dirty radiator! The engine will overheat. You'll lose the anti-freeze and you may cause expensive damage to your car. It's easy to clean out the cooling system of your car with SANI-FLUSH. It costs only 10c. (25c for the largest trucks and tractors.) It takes only a few minutes.

Pour SANI-FLUSH in your radiator. (Follow directions on the can.) Run the motor. Drain. Flush once. Refill with anti-freeze solution. Then you're all set for the winter. SANI-FLUSH is safe—cannot injure motor or fittings. You'll find SANI-FLUSH in grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

**Sani-Flush** **Safe**  
KEEPS RADIATORS CLEAN NOT CAUSTIC



**NEW BRUSH PLATING OUTFIT**  
For  
**AUTO PARTS**

Connects to a battery with no tanks necessary. Plates on iron, steel, brass, copper, etc. Almost as simple as painting. Hundreds of car owners waiting for this low-cost plating.

Improves appearance and value of the car. Your opportunity to make good income plating auto parts, bath-room fixtures, reflectors, mirrors, etc.

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# FREE

## 188 PAGE RADIO CATALOG

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Hard-to-get parts, the latest in radio gadgets, complete stocks of tubes, the biggest selection of build-them-yourself kits — we have them all. Use our **FREE** catalog for easy, economical shopping.

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More power per dollar, greater dependability, more quality, finer performance — Lafayette presents for 1939 the most complete line of quality-built Public Address Equipment in the world.

### AMATEUR APPARATUS

Featuring the makes of every nationally famous manufacturer. Latest type receivers, parts — everything a "ham" needs, and at rock-bottom prices.

### ELECTRICAL APPLIANCES

Modern electrical home appliances priced to afford great savings.

### CAMERAS AND SUPPLIES

All the world's great cameras, complete equipment and supplies — in fact **everything** for both amateur and professional alike, at prices that will amaze you.



### NEW

### TELEVISION

RCA licensed build-it-yourself television kit. Complete with specifications and diagrams. Priced amazingly low.

### VALU-BILL says:

"I've seen lots of catalogs in my day. Take it from me, this one's **TOPS** in more-for-the-money **VALUE!**"



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WHOLESALE RADIO SERVICE CO., INC.  
100 Sixth Avenue, New York, N. Y.

Rush **FREE** Catalog No. 73-7LB

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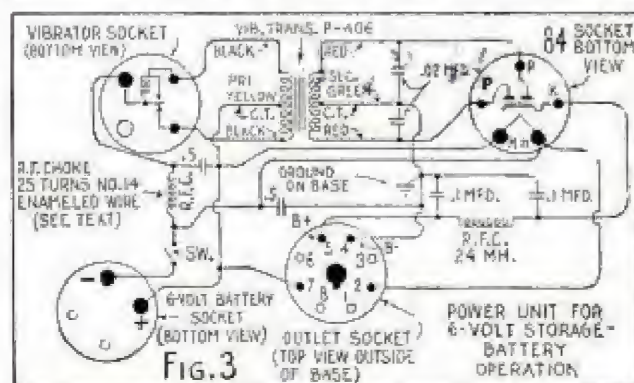
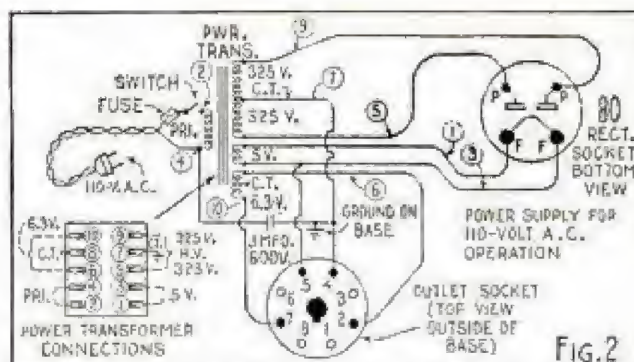
PASTE COUPON ON PENNY POSTCARD

## All-Purpose Power Supply

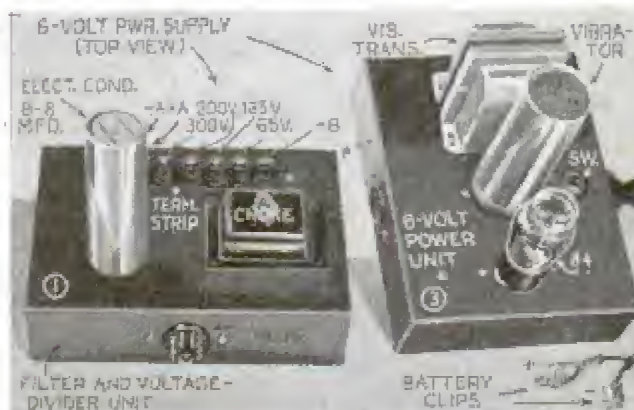
(Continued from page 739)

this unit to the 6-volt storage battery by means of two battery clips. A list of all the materials used in these original units can be obtained from Popular Mechanics Magazine, radio department, without charge. The blueprint number is R-259.

When using units No. 1 and No. 3 for 6-volt battery operation be sure that the



battery clips are marked correctly for polarity, and connected to the corresponding battery terminals. All voltage tap values should be marked plainly on the base near each post. These B-voltage values are ap-



proximate and should be used as called for, within each range given. For all practical purposes B-voltages are not critical, and approximate values within reasonable limits will meet all requirements.



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Has sharp cutting F4.5. Hugo Meyer Anastigmat lens. Vario shutter speeds to 1/1000th. Time and Bulb. \$19.50. Address Dept. P. Send for Free Broc. Enclosed No. 246

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### YOUR TRAILER IS NO SAFER THAN ITS HITCH

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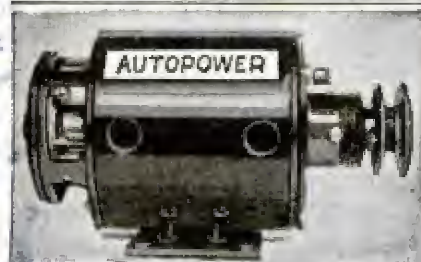
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Imagine! This extra heavy wood lathe. Metal bed 48" long, at low prices. Heavy duty head stock, 4-step cone pulley for V-belt. No. 2 Morse Taper Centers. Sealed ball bearings. 6" face plate screws onto spindle. Tool rest 10" long. Complete line of accessories at amazing low prices. Write today for free catalog describing machinery. Factory-to-con prices. Not sold through agents.

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**MAKES QUICK  
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**"Accordion" of Aluminum Foil  
Insulates House Walls**



When the aluminum foil sheet is pulled out thus, triangular air cells form as additional insulation

Sheets of aluminum foil which can be shipped flat and then expanded like an accordion for installation are offered as an unusually effective house insulating material. When expanded, the two walls of foil enclose a series of triangular air cells and are separated by a light, flameproof material. These air pockets consist of four separate reflective surfaces, increasing the power of the sheet to reflect radiant heat to its source.

**Batteryless Phone Is Energized  
by the Speaker's Voice**

No other source of power than the vibrations of a speaker's voice are needed to operate a tiny portable telephone set developed in the Bell Telephone laboratories. It is intended for short-distance communication in temporary locations or as a batteryless instrument to be carried on the person. Weighing less than two pounds, it is three inches square. When sound waves of the speaker's voice strike the diaphragm, the arma-



ture of the speaker's voice strike the diaphragm, the arma-

*Bell Telephone*

*The Rubberoid Co. 505 5th Ave. New York City*

*463 West 42nd St. New York City*



ture vibrates, affecting a magnetic circuit and inducing voice-frequency currents in a coil surrounding the armature. The same instrument serves as both transmitter and receiver. No bell is required for signaling; when the crank is turned, the diaphragm at the other end of the line sends up a sirenlike tone.

### Inexpensive Fire Extinguisher Is Easy to Operate

Inexpensive and easy to operate, a fire-extinguisher now on the market employs a standard flame-fighting fluid, carbon tetrachloride. The fluid is contained in an airtight can, therefore it cannot evaporate and is always ready for immediate usage. A needle point in the handle of the simple

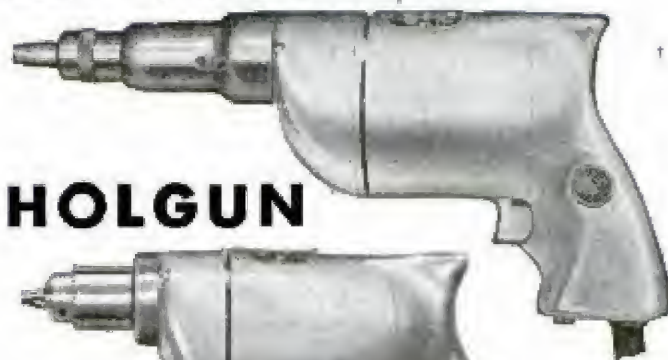


Showing how the extinguisher works. Working the pump handle expels the fluid

pump is used to punch a hole in the top of the can of fluid and another in the bottom. Then the pump is screwed on the can and the stream of fluid directed at the base of the fire by operating the pump handle. The stream is effective over distances of fifteen to twenty-five feet. New cans of the fluid are obtainable.

❑Inquiries as to makers of articles described in Popular Mechanics will be answered by our Bureau of Information upon receipt of return postage.

## SCRUGUN



## HOLGUN



## BOTH BRAND NEW

Just "palm" these tools and you'll want 'em! Their advanced design and very "feel" suggest the countless drilling and assembling jobs you can do so quickly and easily.

HOLGUN is only 6 $\frac{3}{4}$  inches overall—weighs only 44 ounces—yet it's a powerful heavy duty  $\frac{1}{4}$ -inch drill. Its compactness and famous "Pistol Grip and Trigger Switch" permit faster work in tight spots.

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World's Largest Manufacturer of  
PORTABLE ELECTRIC TOOLS



Save NOW... Profit NOW  
ON EVERYTHING  
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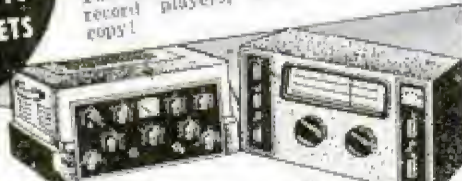
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NEW 1½ V. SETS

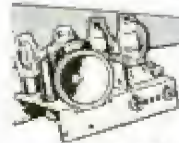
See the radio sensations of 1939—the new Knights—with new power, new beauty, new 1939 features—at new reduced prices. 62 models to choose from—as low as \$6.95—4-16 tubes. Featuring the amazing new "Tiny Knights," new low-drain battery sets (1.5 volt tubes), low-cost Push-Button Tuning, phono-radios, phonographs, record players, etc. Send for your copy!



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As Radio Builders' Headquarters, we can supply matched kits for building any circuit described in any magazine construction article. Write for our Free Parts Lists. See pages 124-7 of ALLIED's Catalog for latest Popular Mechanics Kits; also, Beginners' 1, 2, and 3 Tubes; Auto Set; Photo and Cell Kit; low-cost S-mitters, and over 100 diagrams and projects!

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Dept. 5-L-9

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☐ Send Free Parts List for Kit No. ....

Name .....

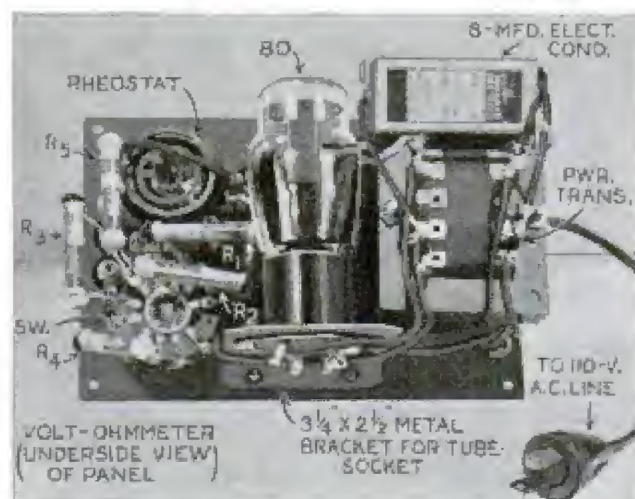
Address .....

## Inexpensive Volt-Ohmmeter

(Continued from page 740)

and carefully insulated from the metal panel. These "banana type" tip-jacks are available with red and black tops to indicate polarity.

For resistance measurements the zero point is adjusted with the rheostat control knob; short the test prods and set for zero. Make this setting each time you use the instrument since the a.c. line voltage changes with time and locality. When the unit is to be idle for some time turn the power off to prevent power pack parts from heating. To proceed with resistance tests, tap No. 1 gives full scale reading for 1 megohm. Multiply all intermediate readings by 1,000; for example 200 on scale would indicate 200,000 ohms. No. 2 tap is



10 megohms full scale; therefore multiply all in-between readings by 10,000. For example 500 on the scale would be 5 megohms. Taps Nos. 3, 4 and 5 are for the d.c. voltage ranges previously mentioned.

This volt-ohmmeter unit is designed to fit in the small wood case shown in the photos; inside dimensions are 3¾ in. deep, 4¾ in. wide and 7 in. long. The lid is 1½ in. deep. This is a standard size box commonly used for various portable radio testing instruments that have been described in previous issues of Popular Mechanics Magazine. If the builder does not require a portable unit, this instrument can be installed in your bench panel.

All parts are standard and should be exactly as specified in the text. Do not attempt to use ordinary fixed resistors in a test set of this description, they must be of the semi-precision variety, accurate within 5 per cent, for efficient operation.



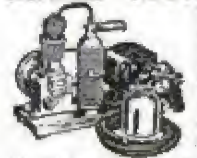
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**DRILL \$7.95**  
**GRINDER \$5.95**  
**SET \$14.95**

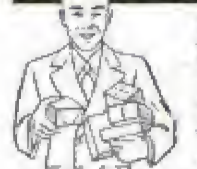
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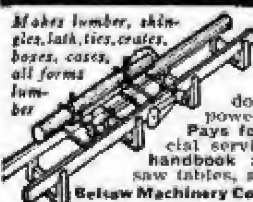
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**T**HIS anti-freeze story is contrary to long-established beliefs. Scientific tests prove that "Zerone" makes a perfect mixture with water and that you lose little or none by evaporation or separation. Radiator losses are due mainly to *mechanical causes*—leaks, sudden stops, etc. Where there is boiling, the losses are of the whole solution—"Zerone" and water—and such losses are in about the same proportions as the original protection.

First, use "Zerone" in accordance with directions on can or protection chart. Second, never assume that it's the water only, or "Zerone" only, that has been lost when your cooling solution is low. Check strength of the solution, and replace the indicated *combination* of "Zerone" and water, or you may have too much protection or too little.

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ONLY \$1 A GALLON

# ZERONE

**Anti-Rust ANTI-FREEZE**



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"Junior showed us your ad," writes W. W. B. "Said he had to have a Royal Portable for homework."



"Your 'Free Home Trial' sounded good to us. So we sent in the coupon that very night."



"Immediately Junior started doing homework easier and faster. And that gave me an idea..."



"Typing's a cinch—with a Royal. Now I work out ideas on it. Already I've gotten one raise."

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A Royal Portable helps you write faster, think faster. It's an opportunity for a better, brighter future—a chance for you, your whole family, to do more, be more!

SEE IT . . . TRY IT in your own home! Know all about a Royal before you risk a penny. See exactly how a Royal will help you whatever your job. Then—own it on your own terms—cash or . . .

ONLY A FEW CENTS A DAY. The easy, modern way to own a Royal. Your choice of five models—all factory-new, reasonably priced.

ACT NOW! Mail coupon today for full details of Royal's offer—all about models, prices, terms—everything. No obligation.



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## New Oil Wells from Old Ones

(Continued from page 643)

of the well. However, since sand is not soluble to acid, acidifying is not used in sandstone formations as a general rule but there are instances when the restrictions in the pores of the sandstone are soluble to acid, and acidifying is effective.

Sometimes a new well may be such a small producer as to offer no profit on the investment. Two such wells were acidified, and in the following two years produced, 226,763 barrels of oil. There is another benefit accruing from the acidifying of new wells. At first practically all horizons are under the same pressure, and naturally the oil will produce through the more permeable sections, reducing the pressure in these sections. But if acidified, the porosity of the horizons will be made more even, since the acid will penetrate all sections to some extent.

Acidifying is being used to increase the capacity of "in-put" wells—wells which take care of water that comes to the surface with the oil. Such wells are either those dug for the purpose, or depleted oil wells, and are treated after the same general method as oil wells.

There are three methods of acidifying. The most effective is the one in which oil is used to direct the height of the acid after it goes into the well. For treating by this method the rods and standing valves, if any, are removed from the well and the casing and tubing pumped full of oil. The oil, gradually displaced by the acid, overflows at the casing head in an amount equal to the amount of acid pumped into the tubing. The acid goes to the bottom of the tubing and out into the casing and then up. When it has reached the height desired, the valve in the casing head is closed and no more oil can escape.

The object now is to force the acid back into the formation where the reaction is to take place. This is done by pumping more acid into the tubing. Since the acid, which is heavier than oil, cannot go any farther up into the casing, it either must go down or horizontally. Resistance being less in the latter direction, the acid is forced outward into the producing area. Then by pumping oil into the tubing, the acid remaining in the tubing is forced right on

(Continued to page 150A)

*Workin' on a Railroad...  
just to pass  
the time away*

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**BUILD 'EM MIGHTY**

**TWO LIONEL SCALE MODELS!**

**WHERE SPACE IS UNLIMITED**  
Mighty "O" Gauge model of the giant that draws the Twentieth Century. So accurate the president of the New York Central has it mounted in his office.

**WHERE SPACE IS LIMITED**  
The biggest little train ever made, 14½ inches of "OO" Gauge scale model perfection, ingeniously constructed so it will circle a track only 27 inches in diameter.

### NOW FOR THE FIRST TIME YOU CAN BUILD A LIONEL SCALE MODEL LOCOMOTIVE

Whether your railroad system is "O" Gauge or "OO" you can now own a Lionel scale model Hudson, for now this masterpiece of all miniatures comes in both scales!

And now, this year, you can buy Lionel's giant, 24½-inch "O" Gauge reproduction as easily as on a time-payment plan. For it comes in five separate kits, one at a time or all at once. Five kits, only \$59.50. Five dollars extra for remote control whistle and whistle controller.

All of the detail and accuracy that Lionel has built into the "O" Gauge Hudson will be found also in the "OO" model. 14½ inches long, it's a veritable power plant. Engine, cars, track and all, as low as \$35. For pictures and details send for the new 1938 Lionel catalog.

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**FOR ALL THE THRILLS OF RAILROADING**

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Be independent, make steady income from home! No new business. Apply industrial water-proofed adhesive (resins, wax, rayon, silk) to any surface. Produces beautiful felt finishes for shoes, purses, hats, boxes, tables, benches, picture frames and 1001 other articles. Simply apply binder, then spray or flock with Jordan flocking gun.

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**New Adding Machine Fits Vest Pocket!..**

Adds, subtracts and multiplies up to one billion. Weighs only 4 ounces. Not a toy—strong guarantee. Absolutely accurate, very fast. Sells in offices, stores, homes wherever figures are used. Write quick for **FREE AGENTS** sample offer and Money-Making Plan.

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It's the modern way to treat minor burns and cuts. Only 30 cents a bottle; wherever drugs are sold. Send for free sample. Dept. PM-2

CAMPHO-PHENIQUE CO., ST. LOUIS, MO.

(Continued from page 149A)

down with the rest and out into the formation. The well itself, now completely full of oil, is closed and left until the acid has had time to eat out the pores of the formation—a day or less, according to conditions. When the treatment is completed, the spent oil and acid are pumped out and the well put back on production.

In the second method there are repetitions of the first. This is essential for wells producing from a very tight formation, particularly in areas in western Kansas and the Texas Panhandle. The cross-sectional area of the formation decreases as the well bore is approached. This lets the oil flow faster, the nearer it comes to the bore. Since it now has more velocity, there is less gas pressure to bring it into the well, yet the oil has more frictional resistance and causes the area to be congested. To relieve this congestion, more than one application of acid is necessary. After each treatment the well is pumped clean of the reaction products, and the next treatment is started with a clean well. This allows close control of the amount of acid needed and the distance it penetrates into the formation.

The third method, the jelly-seal treatment, is for wells that produce from streaks with very large pores. Obviously acid pumped into such a well will seek this producing zone, instead of penetrating the tight formation which needs to be opened. To prevent this, slugs of a heavy jellifying material are circulated with acid to the streaks. The compound being too thick to enter the pores of the tight formation plugs the first producing zone it comes to. The process is repeated with the second zone, and so on, until all the streaks are plugged. These plugs, which remain in the formation only during treatment, revert to a liquid in from twenty-four to thirty-six hours, leaving the porous zones to return to their former production. The change in the jelly is due to bacteria which have been added to the compound before it is put into the well. The compound is pumped out with the spent acid.

When there is a paraffin accumulation in the well, a solvent is used to dissolve it, before acidifying. This accumulation may be in the flow line or in the pores of the formation in exposed places. Since acid

(Continued to page 153A)

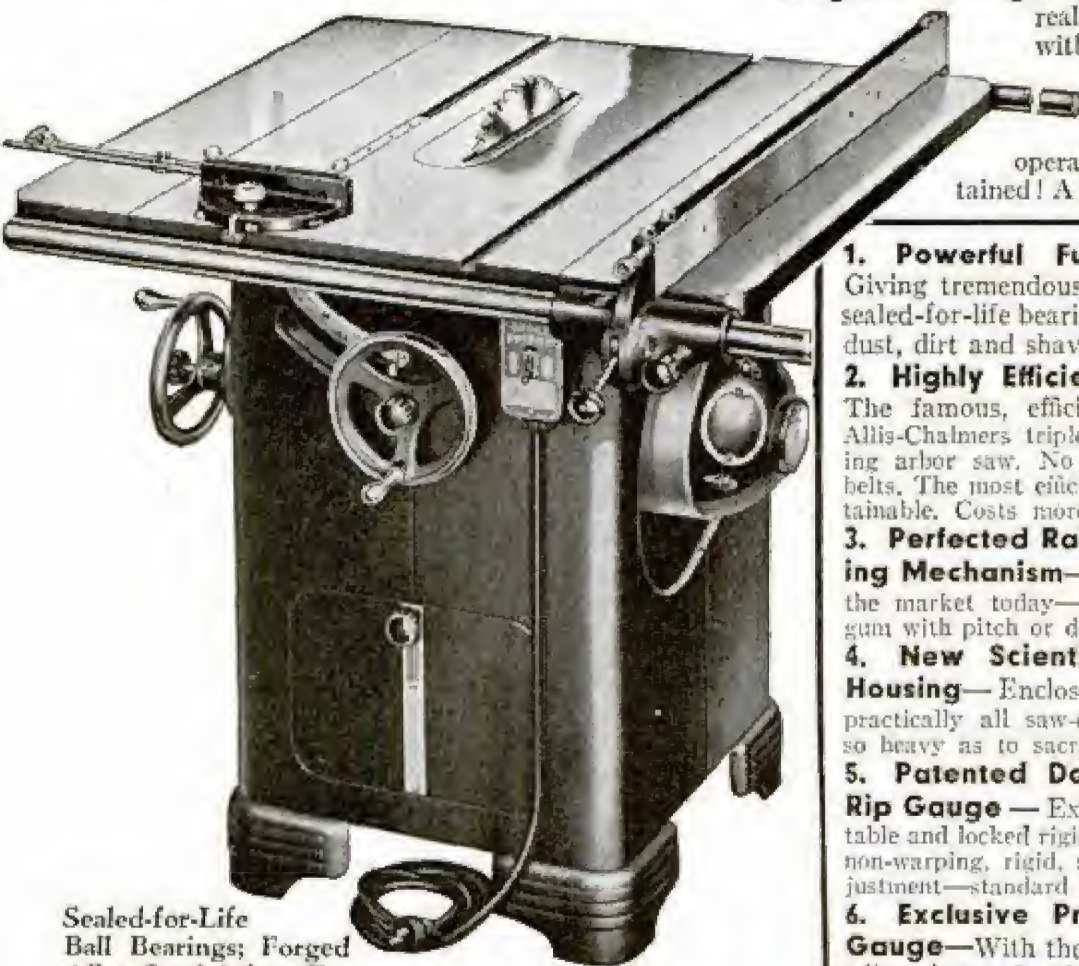


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## *A Perfected* TILTING-ARBOR SAW

Yes—After seven years of patient unremitting experimental work, building and testing model after model,

eliminating "bugs" and weaknesses in existing tilting arbor designs, creating and developing basically new designs—Delta engineers are pleased to announce a really *perfect* tilting arbor saw with *none* of the flaws of existing designs—a saw that offers numerous exclusive advantages and an operating efficiency never before attained! A few of its high points include:



Sealed-for-Life Ball Bearings; Forged Alloy-Steel Arbor; Extra Large Table; "Point-of-Use" Controls and numerous other features, eliminating for the first time all flaws in tilting-arbor saw design.

- 1. Powerful Fully Enclosed Motor**—Giving tremendous power with ample reserve, sealed-for-life bearings, and fully protected from dust, dirt and shavings.
- 2. Highly Efficient "Tex-Rope" Drive**—The famous, efficient drive and trouble-free Allis-Chalmers triple V-Belt adapted for the tilting arbor saw. No gears; no noise; no twisted belts. The most efficient and satisfactory drive obtainable. Costs more than gears—but worth it!
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- 4. New Scientifically Designed Rigid Housing**—Encloses all vital parts; catches practically all saw-dust—modern, rigid; yet not so heavy as to sacrifice portability.
- 5. Patented Double-Face, Double-Lock Rip Gauge**—Extending completely across table and locked rigidly at front and rear. Accurate, non-warping, rigid, safe, and with micrometer adjustment—standard equipment.
- 6. Exclusive Precision Auto-Set Miter Gauge**—With the patented Delta individually adjusted stops for absolute accuracy. Patented clamp attachment for extra fine, exacting work available.
- 7. Patented Ripping Extensions**—Providing full 48" ripping capacity, built in as standard equipment on every saw. No extras to buy, but side table wings available if desired.

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## FREE BOOK

There are so many important new features, so many basic improvements in this new Delta Tilting Arbor Saw that it has been necessary to prepare a complete booklet to tell the story adequately. Liberally illustrated, easy-to-read, this booklet is a dramatic story of modern engineering progress—and at the same time the complete *inside story* of the tilting arbor saw. No man who either now or later faces the problem of selecting a circular saw for any type work—industrial, school, or homecraft, can afford to be without this new booklet.

Send for your copy today—and at the same time receive the new 1939 Delta Catalog illustrating, describing, and listing prices of the complete 1939 line of Delta "Quality" motor-driven tools. Send the coupon TODAY!



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## HOW TO GET THE BEST BUY IN RADIO

Thrill to building your own broadcast receiver. Thrill to performance that outstrips many a "store bought" set. A couple of hours is all it takes to assemble this 4-tube AC-DC TRF receiver. All parts are furnished, including 5" magnetic speaker. Tone is unusually clear, volume ample. Send for **FREE** catalog that describes in complete detail this and many other values.



Radio triumph of the year is this 1939 Lafayette. A "midget" model, with cabinet of smartly molded plastic, its five hi-efficiency tubes give you 7 tube performance. Lafayette Model C-39 is truly a standout buy. A few features: Automatic Volume Control, new Wave Trap, illuminated Clock Dial. Fully described and illustrated in our **FREE** catalog.

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WRITE HERE—  
YOU CAN'T  
GO WRONG!

# STOP DRINKING DIRTY WATER



Now you can filter your drinking water instantly through cellulose fibers right at your faucet as you need it. The Automatic Water Filter delivers sparkling clear water—clear as spring water. So inexpensive that every home can afford it.

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Here is a quick seller that pays you big profits on a product everyone has been waiting for. Write for big money-making proposition and free offer plan today.

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Cross Section of Automatic Water Filter



## NEW—SENSATIONAL—KEYLESS—ELECTRIC GAS TANK LOCK

Cap unlocks—SNAPS OPEN by pressing a button on your dash. STOPS THIEVES—PROTECTS YOUR CAR—IMPROVES ITS APPEARANCE. A money maker—every garage and filling station a potential dealer. Write immediately for exclusive distributorship proposition.

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You can install this hardware on your old doors, or new ones. Door opens in one piece. Heavy steel springs do the work. Closes air-tight. Needs 3" overhead room. Easily installed. Complete with instructions, \$10.00. Circular free. Agents Wanted.

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# WRITE for this big money maker TODAY

## New IRONING CORD SET

It Spins **ROUND** and **ROUND**  
Cannot **kink** or **twist**.

Here is no ordinary new product. This new Wrist-Action Plug is one of the most remarkable new devices ever offered! You never saw anything like it. Housewives are fascinated—held spellbound by the instant demonstration you can give with this new electric iron cord that swings freely in any direction. Ends kinking and twisting—prevents broken wires, burned fuses. Swivel action plug spins round and round—swings from side to side—keeps cord out of the way—no wonder housewives say, "Just what I want," as soon as they lay eyes on it!

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500 N. Clark St. Dept. P-11 CHICAGO





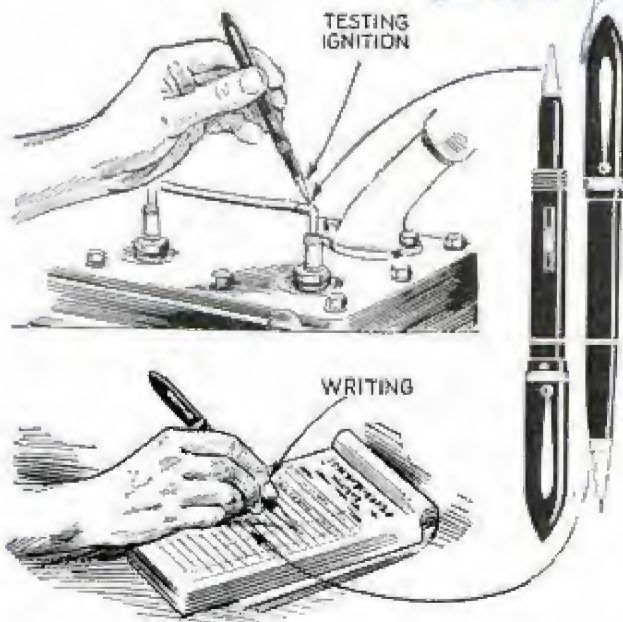
(Continued from page 150A)

has no effect upon it, the paraffin must be removed, otherwise the acid treatment will not be satisfactory. The spent solvent is pumped from the well before the acid is put in. In some cases the solvent treatment may account for an increase in production, since paraffin alone may be to blame for the decrease.

The finding of a solvent for paraffin is one of the greatest boons to the oil industry. Until a few years ago there was no remedy for paraffin in wells, except to melt it out of the pipe with burning gas or hot oil. This process restored production for a short time, but it was detrimental to the well, since there was no way to dispose of the melted paraffin, except to allow it to run down into the bottom of the well where it hardened and gradually filled up the hole.

## Fountain Pencil Checks Ignition by Flashing Light in Tube

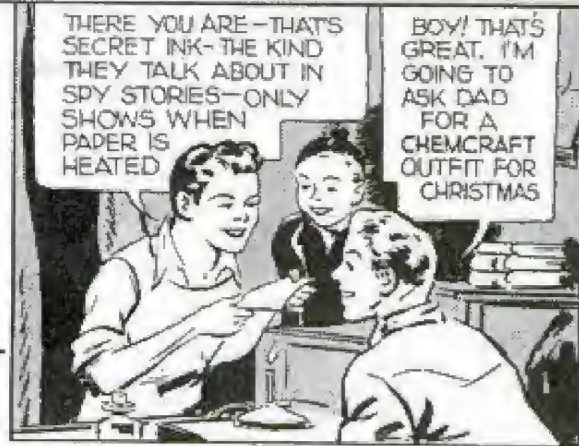
Leading a double life, a pencil which has a conventional retracting lead and eraser at one end becomes an ignition tester when the cap is unscrewed from the other end. It has a bronze pointer to contact spark



When ignition test is satisfactory, a light flashes in slot on side of double-duty pencil

plugs, cable, and other parts while the engine is running. Inside the pencil is a sensitized tube, and the condition of the plug or cable is indicated by light flashes in a narrow window on the side of the pencil.

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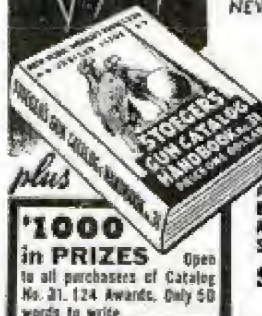


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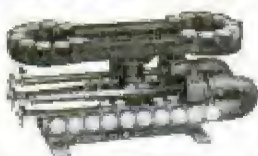
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Detroit, Mich.

## How Fast on Wheels?

(Continued from page 646)

weight to hold him on his course plus a giant power plant to overcome the handicap of extra weight in attaining high speed. Cobb, on the other hand, depended on a smaller and lighter car and only about two-thirds as much power. The smaller size, Cobb reasoned, would decrease the terrific wind resistance encountered at very high speeds.

Eyston's "Thunderbolt"—the most powerful car in the world—has two twelve-cylinder Rolls-Royce engines developing a total of 3,600 horsepower as compared to the 2,500 horsepower developed by Cobb's two twelve-cylinder Napier Lion aviation engines. The total piston displacement of Eyston's car is 4,462 cubic inches while that of Cobb's is 2,920 cubic inches.

Mounted side by side, the "Thunderbolt's" engines deliver power to dual drive wheels at the rear through a normal pinion type transmission having three forward speeds but no reverse. The engines in Cobb's "Railton" are mounted on a diagonal, one motor driving the front wheels and the other the rear wheels.

Braking the seven-ton "Thunderbolt" called for the most ingenuity in its design. In last year's runs, Capt. Eyston found it more difficult to stop his speed machine in the six miles left of the course after completing the measured mile than to hold the great racer on a straight course at top speed. To stop with a minimum of side sway, he now uses a combination of mechanical and air brakes.

The air brakes are flaps sunk into the top of the hull. On pressure from hydraulic jacks actuated by a button in the driver's cockpit, these flaps elevate at right angles to the body, providing sudden uniform air resistance. The flaps are applied to slow down the car before the mechanical brakes are used.

Both cars are super-streamlined, the "Thunderbolt" resembling a huge, slightly flattened cigar while the "Railton" is turtle-backed. Only the driver's cockpit and two supercharger intakes project from the "Thunderbolt's" hull. The cockpit itself, placed almost above the front axle and near the comparatively small radiator matrix in the nose, is covered completely

(Continued to page 157A)



NOW I KNOW WHAT FRED MEANT  
WHEN HE SAID HE GOT HIS PAY BOOST  
OUT OF A TWO DOLLAR BOOK.



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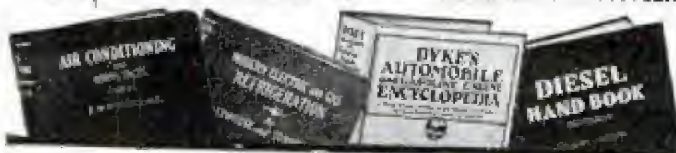
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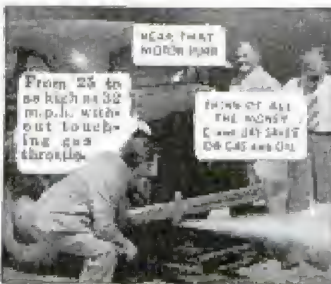


In sluggish cars that waste gasoline and pump and burn oil because of gum-stuck piston rings and valves. These motors can now be conditioned in 20 minutes the C and Jay way.

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C. F. Colby says "Profits up to \$158.00 for few days time."

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GRAVER-JAY CORP., Dept. 140 Kansas City, Mo. References: K. C. Banks—K. C. Chamber of Commerce.

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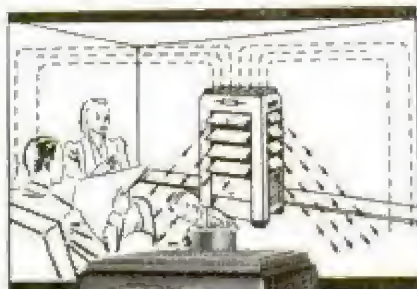
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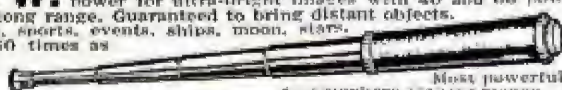
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## Attention: Compressor Users THE SMITH AIR COMPRESSOR cuts the cost of compressed air

If you use a compressor, by all means, investigate THE SMITH. Powered by a FORD MOTOR it gives smooth, low-cost performance. Used the world over to replace large, cumbersome compressors in a majority of work such as drilling rock, breaking pavement, riveting, sand blasting, spray painting, metallizing, and general use with pneumatic tools.

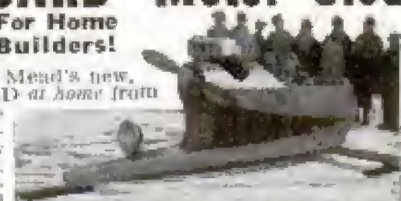


With a Ford Motor and shop facilities you can assemble your own compressor. We will furnish a Smith Compressor Head and Accessories with instructions for mounting. Write Dept. D for details stating the use you have in mind.

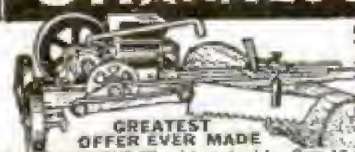
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Now you can easily build Mead's new, streamlined MOTOR SLED at home from Drawings, parts or complete Construction Kit! Uses OUTBOARD or other engine. Low cost. Amazing speed. Seats 2. Also Ice-Boats, Ki-Yaks, Sailboats. Rush 10c for illustrated literature. MEAD GLIDERS, 15 E. Market, Dept. 118-B, CHICAGO.



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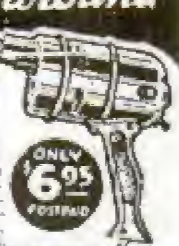
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MAKE MONEY! Wood is valuable. Saw 15 to 20 cords a day. Does more than 10 men. Ottawa easily operated by man or boy. Sails trees—saws fires. Use 4-hp. engine for other work. Write for FREE book. OTTAWA MFG. CO., 1327 Wood St., Ottawa, Ka.

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The new **WHIZ** ELECTRIC TOOL is the handiest power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through 1/4 inch iron plate in 42 seconds; engraves intricate designs on jewelry. Handles any material. Metals—Woods—Alloys—Plastics—Glass—Steel—etc. Saves time. Eliminates labor. Plus into any socket AC or DC, 110 volts. Chuck 1/4 inch capacity. Built beating thrust. Powerful, triple-gear motor. "Worth its weight in gold." STANDARD MODEL with normal speed (uses 30 different accessories, instantly interchangeable). Special introductory price for limited time, only \$6.95. Guaranteed for one year. **FREE** Accessory outfit (Value \$2) includes set of drills, mounted 1 1/2 inch grinder, grinding discs, cutting wheels, mounted brush, polishing wheel, carving bar, etc. **FREE** with each outfit ordered NOW. We pay postage. Write Dept. C. O. D. if desired. **10-DAY TRIAL—MONEY BACK GUARANTEE** Special "2-SPEED" MODEL combines Normal Speed and High Speed in one outfit (uses 200 accessories) only \$5.95 complete, with some accessory outfit (Value \$2) **FREE**. **PARAMOUNT PRODUCTS CO.** Dept. 11A 48 West 40th St. New York

ONLY  
**\$6.95**  
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(Continued from page 154A)

with a sliding glass top. Specially built conduits assure proper ventilation and elimination of gases but, as an added precaution, the driver wears an oxygen helmet.

The "Thunderbolt" has a fin at the tail to give it stability at high speed. Cobb did not consider this precaution necessary on his smaller and lighter "Railton." Eyston uses the fin and the four front wheels for steering. The front wheels are in tandem, "crab" fashion, the second pair with a wider axle than those in front. Each of the eight wheels on the "Thunderbolt" is forty-four inches in diameter.

The "Thunderbolt" is thirty-four feet long, seven feet wide and forty-six inches high at the top of the hull above which the fin projects about three feet. The car is low, its radiator being only seven and one-half inches above the ground. It carries thirty gallons of gasoline and twenty-eight gallons of oil, consuming about six gallons of gasoline per minute when operating. A truck provides the starting power because, if the machine started on its own, its great weight might burn the tires before an actual run started. The tires are smooth rubber, have no tread on the road surface and the fabric sidewalls are covered with only a thin film of rubber.

The Bonneville Salt Flats track, on which the world's highest land speeds have been reached, provides miles of gleaming white salt, hard as concrete when dry. The measured mile forms the center of a thirteen-mile straightaway, marked its entire length by a black oil stripe eleven inches wide. The course allows six miles to reach peak acceleration and six miles to stop after passing through the measured mile.

While the course seems long, experts say the distance is insufficient both for acceleration and deceleration. A longer pick-up stretch, they assert, might enable drivers to attain even higher speeds before reaching the measured mile while a longer stopping distance would mean greater safety.

To establish a record, a run is made in each direction and both must be made within an hour. Three sets of electric eyes, one at each end of the measured mile and one at the judges' stand in the center, give the time to one-thousandth of a second.

Auto speed marks have been pushed

(Continued to page 158A)

## WILL THIS BE YOU on the first cold morning?



For quick starting in cold weather, when oil is stiff and valves tend to stick, the battery must be fully charged and all cables and connections must be in A-1 condition. If battery cables are corroded or undersize, the starting motor will not get sufficient voltage to spin the engine and leave enough in reserve for ignition.

## HERE'S THE ANSWER TO QUICK, SURE STARTING



Go to a service station or garage handling Packard cables, and have your starting circuit checked for frayed, corroded, undersize or otherwise defective cables. Install Packard full No. 1 gauge Battery Cables (No. 0 gauge for extra long cables) and make sure of full starting power.



Have the service man inspect your spark plug wires. If they are cracked and worn, it means that you are not getting the fat, hot spark at the spark plugs that is necessary for quick starting, pep and power. Install a complete set of Packard 440 Spark Plug Wires and seal in the electricity—for sure starting this winter. Packard Electric Division, General Motors Corporation, Warren, Ohio.

**RE-WIRE WITH  
PACKARD BATTERY CABLES  
PACKARD 440 SPARK PLUG WIRES**

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THE STANDARD WIRING EQUIPMENT OF THE AUTOMOTIVE INDUSTRY



## SCIENCE BARES AMAZING FACTS ABOUT SHAVING

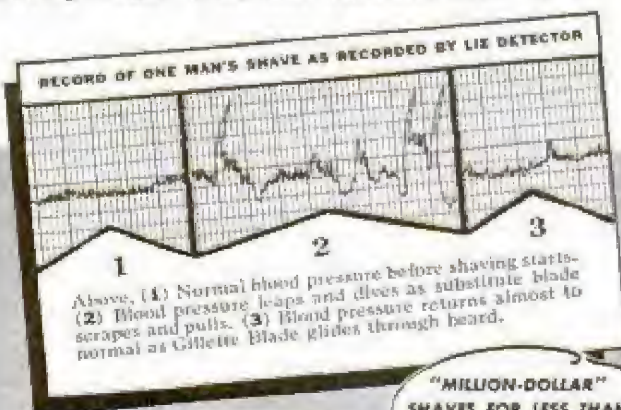


### Lie Detector Proves Superiority of Gillette Blades

EMPLOYING a Lie Detector to disclose the naked truth about razor blades, Dr. Wm. M. Marston, eminent psychologist, is conducting an amazing series of shaving tests. Strapped to the Lie Detector, men from all walks of life shave one side of their face with a Gillette Blade—the other side with a competitive blade. Comparative quality . . . as revealed by their involuntary emotions . . . is automatically recorded on charts.

The results prove the superiority of the Gillette Blade. Also the subjects, naming their preferences, blindly by number, select Gillette more than 9 times out of 10! See the chart below . . . study the evidence . . . and make a comparative test yourself. You'll prefer Gillette, too!

Prepare your beard for a perfect shave with Gillette Brushless Shaving Cream. A big tube costs only 25¢. Try it!



MORE SHAVING COMFORT  
FOR YOUR MONEY

"MILLION-DOLLAR"  
SHAVES FOR LESS THAN  
A PENNY A DAY

# Gillette Blades

PRECISION-MADE TO FIT YOUR GILLETTE RAZOR EXACTLY

(Continued from page 157A)

steadily upward during recent years because, among other things, designers have been able to draw upon the aviation industry for engines of super-horsepower, thus bringing down the cost of construction. Eyston's car, for instance, cost about \$50,000 and both cars are powered by airplane engines.

While land speed marks are still about 100 miles an hour under air speed marks, land speeds during the past few years have been pushed up faster than airplane speeds. As far as spectators are concerned, however, a car traveling about six miles a minute appears to be going faster than an airplane doing seven miles a minute because it is nearer the scene of action.

Those who have seen the speed machines in action on the Salt Flats assert the cars travel so fast they have passed before you hear the noise of the exhaust. And when something whizzes by so rapidly that it is gone before you hear it, it's traveling, whether it's on the ground or in the air.

### LIGHTWEIGHT BRICK PERFORATED WITH INSULATING AIR CELLS

Cellular brick that weighs one-third less than the standard building brick of the same size, yet contains the same amount of clay, is being produced by a new machine.



Air and moisture are squeezed out of the clay and it is pressed into a highly concentrated structure honeycombed with air cells which have an insulating value. The walls are strong and imper-

vicious to moisture, and in a laboratory test one of these bricks withstood a load of 220,000 pounds. In every ten square feet of wall there are 48,700 small air cells, sealed against each other by mortar which prevents circulation of air or moisture. Lighter weight means a saving in freight, handling and laying.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.



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Onan A.C. plants furnish same current as city lines, 110 Volt, 60 Cy. For farms, camps, construction jobs. Operate radios, water systems, all appliances. New models, 350 to 5000 watts, 6, 12, 32 and 110 volt D.C. Models \$57.50 and up. Also combination A.C.-D.C. units. Shipped complete, ready to run.

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Jig Saw: Includes 12 assorted blades, blade adapters, roller saw guide and manual. 15" long, 8" high, 8 1/2" table. Cuts wood up to 2" thick.

**JIG SAW****\$1.50****CIRC. SAW****\$3**

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A husky, smooth running wood lathe—32" long overall; 7" high.

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Time weighs 10 lbs.; fully adjustable; oilless bushings; long and short tool rests; two speed pulley.

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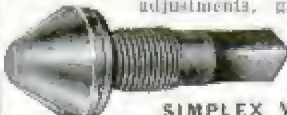
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**POWERLITE** (at right) America's finest electric lantern. 6-volt, 2 reflectors—front, about 800 ft. beam; top, gives wide floodlight, 80-100 hours light. Unbreakable lens. At sport, hard-wave and electrical dealers or write direct to Delta Electric Co., Marion, Ind. Dept. 300

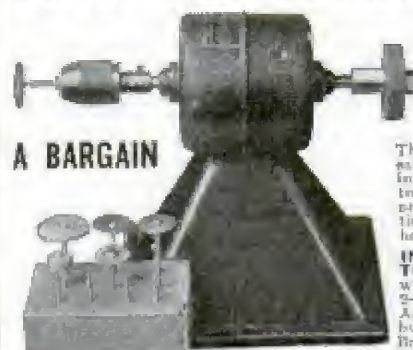
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## UNIVERSAL GRINDER \$4<sup>95</sup>

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**INCLUDES  
30 PIECE  
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The grinder that is truly universal in its application to jobs impossible with other power tools. This versatile tool is needed by jeweler, optician, dentist, laboratory, model maker and home craftsman.

**INCLUDES 30 PIECE ARBOR TOOL SET:** 9—Grind stones with brass centers assorted sizes. 2—Bakelite cut-off wheels. 3—Assorted engraving or carving burrs. 2—Polishing buffs. 1—Bristle polishing brush. 10—Assorted sanding discs, emery, sand, garnet, fine, coarse and medium. 2—Screw Mandrels. 1—Large grind stone.

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Rush \$1.00. Balance C. O. D.

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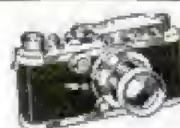
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Send Coin or Money Order  
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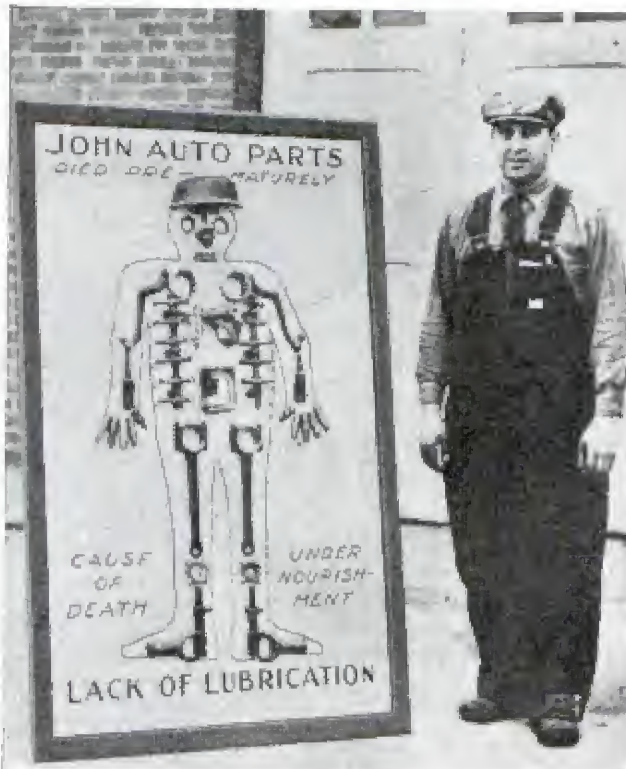
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You can try 3-in-1 Electric Torch for 10 days at our risk or get new absolutely Free by helping to introduce it. Write for Free particulars.

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## Skeleton Made of Auto Parts Warns Motorist to Oil Up



*This warning sign tells motorists how necessary it is to keep the car lubricated*

In front of a Green Bay, Wis., garage and service station is a startling display—a skeleton made of worn automobile parts. A mechanic, Bill Graunke, conceived the idea and collected old parts that could be assembled in the form of a human skeleton which would stand as a warning to motorists to take care of their cars by proper lubrication.

## Invisible Rays as Yard Stick Show Billionth of Inch

Engineers toy with incredibly minute measuring units, too small for mechanical "yard sticks." Recently Westinghouse engineers have even used X-rays to measure the crystals in a new hard-copper alloy. With these invisible wave lengths, they determined distances to a billionth of an inch. Cathode rays draw curves of a millionth of a second duration. Precision gauges measure with a five-millionth of an inch, light wave lengths being used in the last two cases.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.



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Blue prints have been O.K'ed, working models have passed the rigid Atlas tests, and the new Atlas developments for 1939 will soon be off the production line. What are these developments? How will they benefit you in your business or in your home shop? Be one of the first in your community to have complete information. Write today to reserve your copy of the new 1939 Atlas Catalog.



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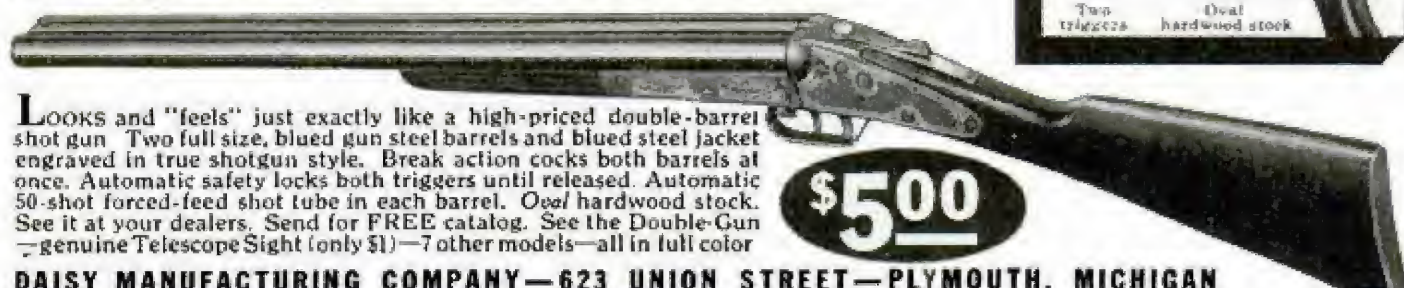


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Enclosed \$..... for ..... number of Kits. Send C.O.D. sample unit for which I will pay Postman \$2.25 plus few cents postage.

NAME.....  
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Looks and "feels" just exactly like a high-priced double-barrel shot gun. Two full size, blued gun steel barrels and blued steel jacket engraved in true shotgun style. Break action cocks both barrels at once. Automatic safety locks both triggers until released. Automatic 50-shot forced-feed shot tube in each barrel. Oval hardwood stock. See it at your dealers. Send for FREE catalog. See the Double-Gun—genuine Telescope Sight (only \$1)—7 other models—all in full color

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INVESTIGATE NOW. Send for "4 Keys to Success." It tells the complete story—how present manufacturers are making outstanding progress in a business offering unlimited opportunity for growth, expansion and profit. Write today.

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Pony Miniature  
9 types—1" to  
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Pony "30" Fittings go on ordinary 1/2" pipe. Any length. Send \$3.00 plus postage (6 lbs.) for fittings for two "30" Clamps. Also "Pony" #32 Fittings for 1/2" pipe—2 sets for \$1.50 plus postage.

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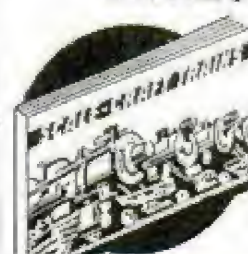
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## LEATHERCRAFT

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FULL GRAIN WOLVERINE HORSEHIDE

*Dry Soft.. Stay Soft!*

MILLIONS know you can't beat WOLVERINES! They're triple-tanned by secret process... soft as lambskin, tough as nails! Full Grain Horsehide... not split... yet always dry out soft and comfortable. Cut to fit the hand-at-work! Seams lock-

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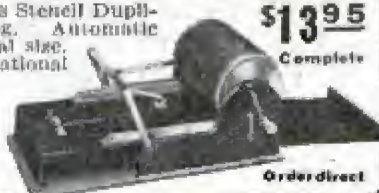
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HORSEHIDE WORK GLOVES

Pony-White  
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Driver's Slip-On  
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3 Speeds  
Fwd. and Reverse.  
Runs 4 to 8 hrs. per  
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Amazing money maker for farms, truck gardens or  
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Plows, discs, barrows, cultivates, mows lawns, cuts  
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the best LIQUID FISH GLUE



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**ELECTRIC  
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. . . Compare with any \$15 competition . . . Fully Guaranteed.  
. . . Operates on either 110 or 120 volts AC or DC current. Send one dollar and your shaver will be forwarded immediately C.O.D. \$2.35 plus 15c postage.

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All cars with spare tire in trunk should have this convenient "Spape-Air Connection." Assures spare being inflated when other tires are serviced, guards against danger of inflating spare tire flat when you need it worst. Not necessary to unlock trunk or move baggage, to inflate the tire. New valve connection installed near trunk door. Easy installation, simple instructions with each set. High quality materials throughout. This new and novel device sent postpaid for \$1 and name of your preferred accessory dealer. Guaranteed perfect materials and workmanship. Money back if not satisfied. Send order direct to:



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Not a wax - not an oil polish - not a paint - nothing that "smears" over the surface. A creamy liquid - quick and easy to apply! Gives a hard, glass-like surface. Even gasoline cannot dull it! Lasts six months to a year! Amazing luster - beautiful, sparkling clean and brilliant! Doesn't fingermark - doesn't smear! Seals the pores - protects! Nothing like it!

**FREE** Write now for Free booklet and **SAMPLE OFFER**. Free Trial offer. Just send your name and address.

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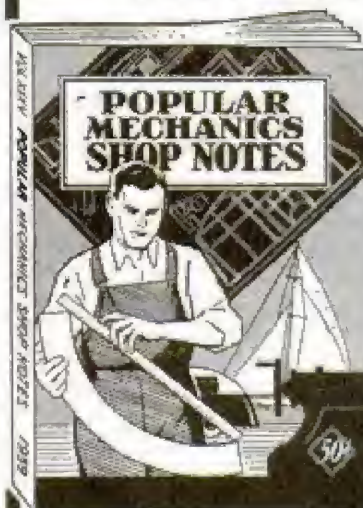
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224 Pages  
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Gas Engine, Midget  
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Grease Pit, Cover for  
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Marble, Installation  
Metals, Belling and  
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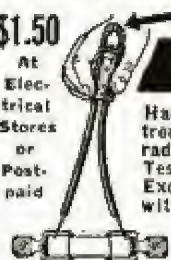
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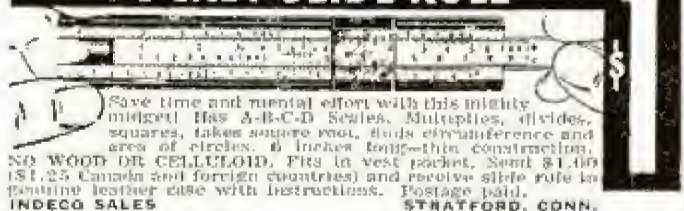
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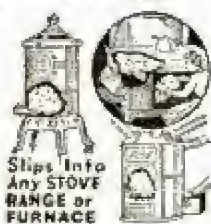
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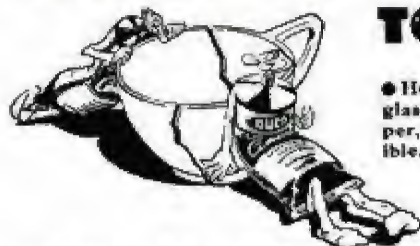
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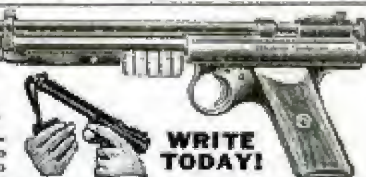


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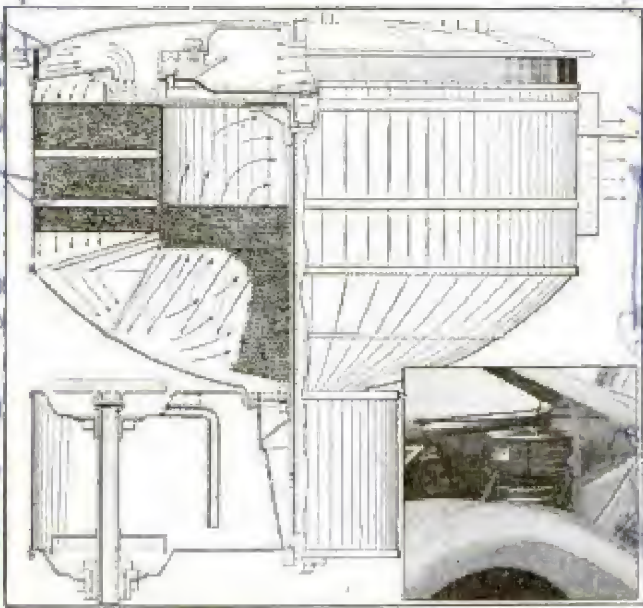
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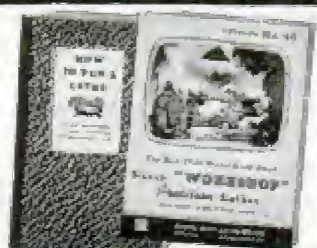
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